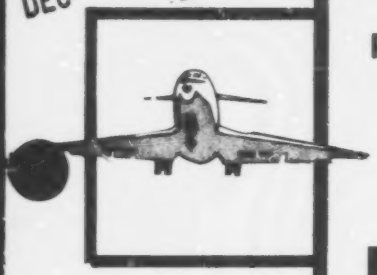
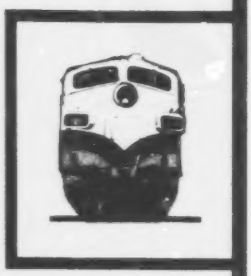
DEC 5 1985

982-I-11

TD 1.112/3:85/12

PB85-916312





NATIONAL TRANSPORTATION SAFETY BOARD

ORIGINAL
COMPLETED

WASHINGTON, D.C. 20594

RAILROAD ACCIDENT REPORT

DERAILMENT OF SEABOARD SYSTEM RAILROAD TRAIN NO. F-690 WITH HAZARDOUS MATERIAL RELEASE JACKSON, SOUTH CAROLINA FEBRUARY 23, 1985 AND COLLISION OF SEABOARD SYSTEM RAILROAD TRAIN NO. F-481 WITH STANDING CARS ROBBINS, SOUTH CAROLINA FEBRUARY 25, 1985

NTSB/RAR-85/12

UNITED STATES GOVERNMENT

BEST COPY AVAILABLE

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. NTSB/RAR-85/12	2. Government Accession No. PB85-916312	3. Recipient's Catalog No.
4. Title and Subtitle Railroad Accident Report--Derailment of Seaboard System Railroad Train No. F-690 With Hazardous Material Release, Jackson, South Carolina, February 23, 1985; and Collision of Seaboard System Railroad Train No. F-481 with Standing Cars, Robbins, South Carolina, February 25, 1985		5. Report Date October 16, 1985 6. Performing Organization Code 8. Performing Organization Report No.
9. Performing Organization Name and Address National Transportation Safety Board Bureau of Accident Investigation Washington, D.C. 20594		10. Work Unit No. 4122C 11. Contract or Grant No. 13. Type of Report and Period Covered Railroad Accident Report February 23, 1985 February 25, 1985
12. Sponsoring Agency Name and Address NATIONAL TRANSPORTATION SAFETY BOARD Washington, D. C. 20594		14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract About 7:15 a.m., on February 23, 1985, Seaboard System Railroad (SBD) train No. F-690 derailed at Jackson, South Carolina, while traveling about 53 mph. The train struck a cushion unit that had dropped from a cushion-underframe boxcar in a train which had passed through Jackson about 5 hours earlier. Eight of the 27 derailed cars were tank cars laden with cyclohexane. The tank cars did not have head shield protection. Cyclohexane was released through tank head penetrations and was ignited immediately. Although no fatalities or injuries resulted from the accident, damage was estimated at $1,293,133, and residences within a 1-mile radius of the accident site were evacuated.

About 7:50 a.m., on February 25, 1985, SBD train No. F-481 struck the rear of standing cars at Robbins, South Carolina. The train was being operated on an absolute block in manual block territory on a nonsignalized, single main track. The standing cars were from a train left at Robbins 2 days before because of the main track blockage at Jackson from the earlier derailment. The accident resulted in three serious injuries, and damage was estimated at $66,455.

17. Key Words dispatcher; manual block system; radio; telephone; initial terminal brake test; cushion-underframe unit; hazardous materials; tank car head shields; derailment; collision; procedures; top-and-bottom shelf coupler; inspection; maintenance; supervision	18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161		
19. Security Classification (of this report) UNCLASSIFIED	20. Security Classification (of this page) UNCLASSIFIED	21. No. of Pages 44	22. Price

NTSB Form 1765.2 (Rev. 9/74)

BEST COPY AVAILABLE

Abstract continued

The National Transportation Safety Board determines that the probable cause of the accident at Jackson, South Carolina, on February 23, 1985, was the laxity of the Seaboard System Railroad mechanical maintenance, inspection, and supervisory practices which resulted in the striking by train No. F-690 of a cushion unit that had dropped onto the track structure from a cushion-underframe boxcar about 5 hours earlier. Contributing to the severity of the accident was the lack of head shield protection on tank cars carrying high-risk hazardous materials.

The National Transportation Safety Board determines that the probable cause of the accident at Robbins, South Carolina, on February 25, 1985, was the failure of the dispatchers on duty during a period of unusual dispatching events, necessitated by the accident at Jackson, South Carolina, 2 days before, to adhere to established and documented procedures. Contributing to the accident was the failure of the Seaboard System Railroad to supervise the dispatchers properly to ensure adherence to its established and documented procedures.

BEST COPY AVAILABLE

CONTENTS

SYNOPSIS 1

INVESTIGATION 2
The Accident at Jackson, South Carolina 2
Events Following the Accident at Jackson, South Carolina 6
The Accident at Robbins, South Carolina 8
Injuries to Persons 10
Damage 10
Personnel Information 13
Train Information 17
Method of Operation 17
Track Information 21
Meteorological Information 21
Medical and Pathological Information 21
Tests and Research 21
Other Information 24

ANALYSIS 26
The Jackson, South Carolina Accident 26
Unacceptable Risks Posed By Inadequately Safeguarded Tank Cars 28
The Robbins, South Carolina Accident 29
Mechanical Maintenance and Inspection Procedures 31
Manual Block System Dispatching 31

CONCLUSIONS 33
Findings 33
Probable Causes 34

RECOMMENDATIONS 35

APPENDIXES 37
Appendix A--Investigation 37
Appendix B--Personnel Information 38
Appendix C--Work Message Received by Crew of Extra 5523 West 41
Appendix D--Railroad Accident Reports Concerning Tank Cars Carrying High-Risk Hazardous Commodities 42

BEST COPY AVAILABLE

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

RAILROAD ACCIDENT REPORT

Adopted: October 16, 1985

DERAILMENT OF SEABOARD SYSTEM RAILROAD TRAIN NO. F-690 WITH HAZARDOUS MATERIAL RELEASE, JACKSON, SOUTH CAROLINA, FEBRUARY 23, 1985; AND COLLISION OF SEABOARD SYSTEM RAILROAD TRAIN NO. F-481 WITH STANDING CARS, ROBBINS, SOUTH CAROLINA, FEBRUARY 25, 1985

SYNOPSIS

About 7:15 a.m., on February 23, 1985, Seaboard System Railroad (SBD) train No. F-690 derailed at Jackson, South Carolina, while traveling about 53 mph. The train struck a cushion unit that had dropped from a cushion-underframe boxcar in a train which had passed through Jackson about 5 hours earlier. Eight of the 27 derailed cars were tank cars laden with cyclohexane. The tank cars did not have head shield protection. Cyclohexane was released through tank head penetrations and was ignited immediately. Although no fatalities or injuries resulted from the accident, damage was estimated at $1,293,133, and residences within a 1-mile radius of the accident site were evacuated.

About 7:50 a.m., on February 25, 1985, SBD train No. F-481 struck the rear of standing cars at Robbins, South Carolina. The train was being operated on an absolute block in manual block territory on a nonsignalized, single main track. The standing cars were from a train left at Robbins 2 days before because of the main track blockage at Jackson from the earlier derailment. The accident resulted in three serious injuries, and damage was estimated at $66,455.

The National Transportation Safety Board determines that the probable cause of the accident at Jackson, South Carolina, on February 23, 1985, was the laxity of the Seaboard System Railroad mechanical maintenance, inspection, and supervisory practices which resulted in the striking by train No. F-690 of a cushion unit that had dropped onto the track structure from a cushion-underframe boxcar about 5 hours earlier. Contributing to the severity of the accident was the lack of head shield protection on tank cars carrying high-risk hazardous materials.

The National Transportation Safety Board determines that the probable cause of the accident at Robbins, South Carolina, on February 25, 1985, was the failure of the dispatchers on duty during a period of unusual dispatching events, necessitated by the accident at Jackson, South Carolina, 2 days before, to adhere to established and documented procedures. Contributing to the accident was the failure of the Seaboard System Railroad to supervise the dispatchers properly to ensure adherence to its established and documented procedures.

BEST COPY AVAILABLE

INVESTIGATIONS

The Accident at Jackson, South Carolina

About 2:02 a.m., 1/ on February 23, 1985, the crewmembers of Seaboard System Railroad (SBD) train No. F-480, en route from Augusta, Georgia, to Florence, South Carolina, received an indication from the defect detector 2/ located at Jackson, South Carolina, that dragging equipment had been detected in their train. (See figure 1.) The locomotive engineer stopped the train, and the brakeman and flagman, acting on instructions from the conductor, walked back to the 38th car in the train to inspect for dragging equipment. The defect detector had indicated that dragging equipment was located 214 axles from the rear of the train, and the conductor calculated that to be on the 38th car from the head of the train. SBD operating rules specify "when a defect is not found at location indicated, 5 cars on each side of reported defect must be inspected . . . ." The brakeman and flagman stated that they inspected the 28th through the 48th cars of the train but found no conditions to which they took exception. The brakeman and flagman reboarded the train, which then proceeded to Florence, setting out and picking up several cars while en route, including a stop at Sumter, South Carolina. About 4:59 a.m., SBD train Extra 8532 East passed the defect detector at Jackson uneventfully while en route from Augusta to Savannah, Georgia.

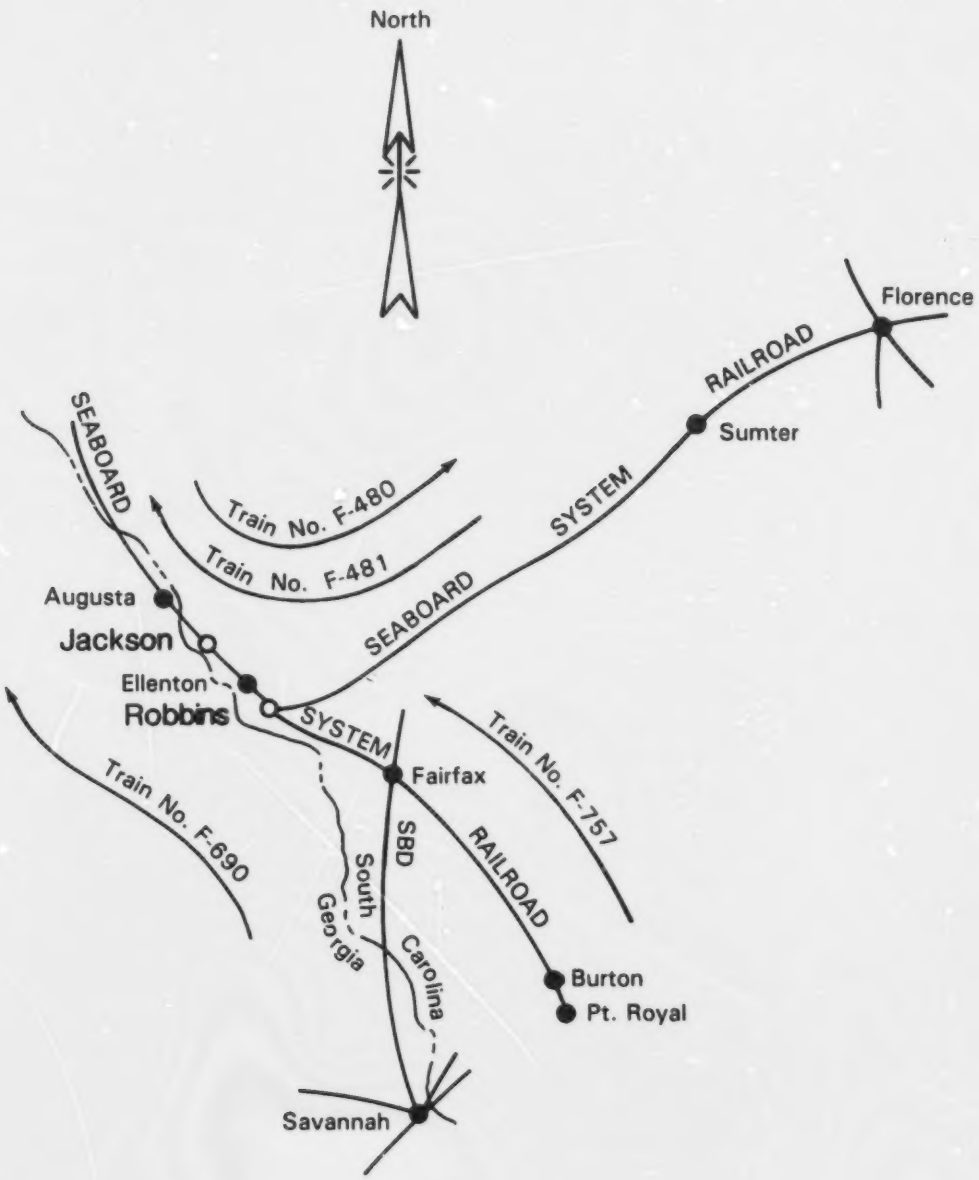
About 7:15 a.m., SBD train No. F-690, a run-through train with no cars to be set out or picked up en route, was passing through Jackson, en route from Savannah to Augusta. The engineer stated that his locomotive had just passed the defect detector and he had sounded the warning whistle signal for an at-grade road crossing near the defect detector when he got up from his seat to get a drink of water. "When I sat down, I felt and heard us hit something," the engineer stated. "When I looked out my window, I saw an object rolling out into the woods. I saw it come from underneath the train and go out into the woods and it looked about the size of a crosstie. But I couldn't tell you exactly what it was because there was debris flying all around it." Almost immediately afterwards, the train automatic airbrake applied in emergency. Twenty-seven cars--18 cars (the 2nd through the 19th cars) near the front of the train and 9 cars (the 40th through the 48th cars) further back in the train--were derailed. (See figure 2.) The five-unit locomotive and one car which remained coupled to the locomotive came to a stop after traveling about three-fourths of a mile. The engineer stated that the speed of train No. F-690 was about 49 miles per hour (mph) when the derailment occurred. (The defect detector recorded the train speed at 53 mph.) Located among the derailed cars near the front of the train were eight tank cars containing cyclohexane, a flammable liquid. All of the tank cars were severely damaged, leading to the release of cyclohexane, which ignited immediately. (See figure 3.)

Immediately after the accident, the engineer radioed the yardmaster at Augusta to inform him of the accident and of the hazardous material release and fire, and to request emergency response forces. The engineer then radioed the conductor of train No. F-690 to determine whether anyone on the caboose was injured and to determine the location where the caboose stopped. SBD personnel at Augusta immediately notified emergency response forces of the accident.

1/ All times in this report are Eastern standard time.

2/ The defect detector is a device used to discover whether a train passing the location of the detector has any dragging equipment or overheated journal bearings, which could endanger the continued movement of the train.

BEST COPY AVAILABLE



NO SCALE

Figure 1.--Seaboard System Railroad track locations in accident area.

BEST COPY AVAILABLE

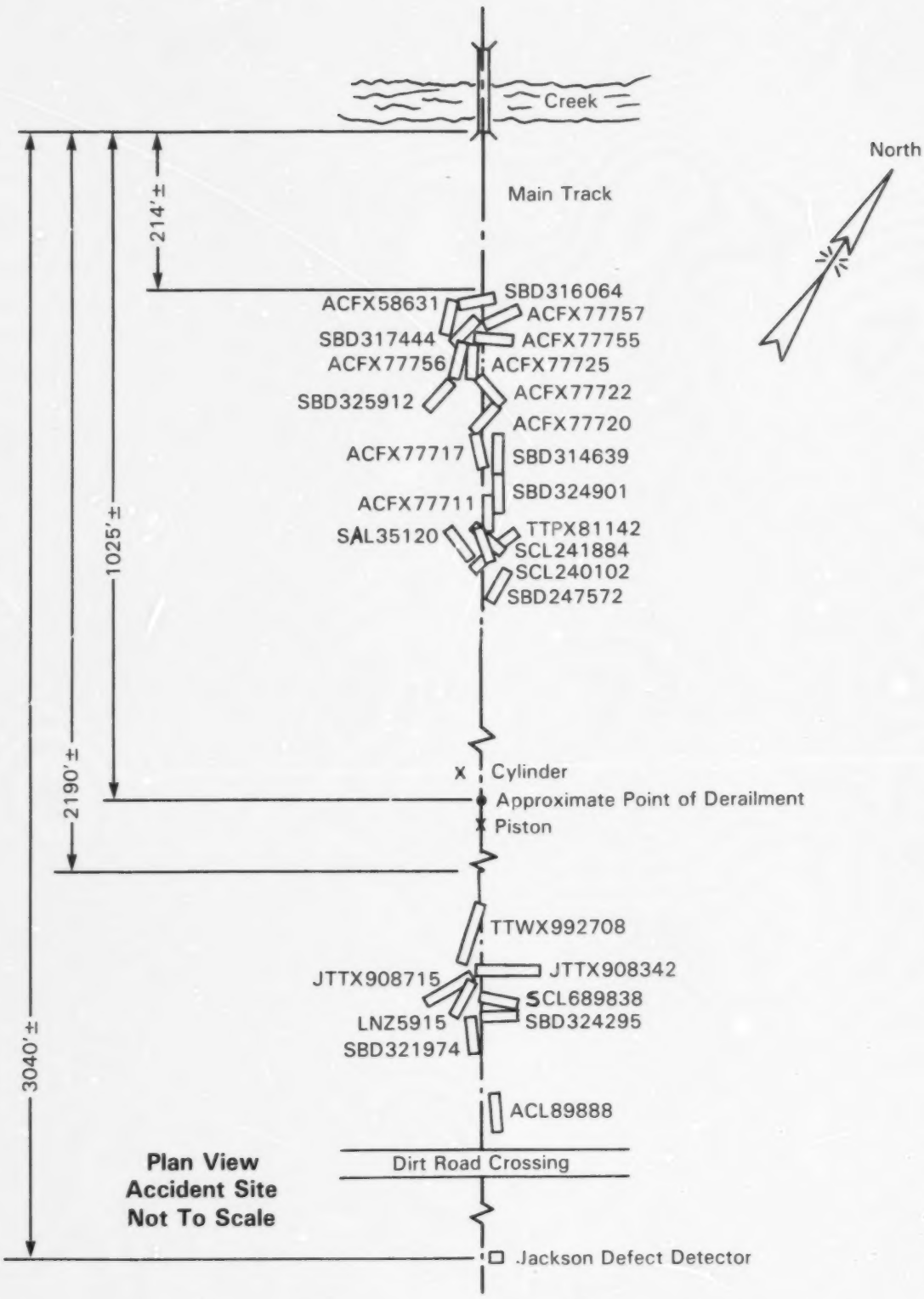


Figure 2.--Plan view of Jackson accident site.

BEST COPY AVAILABLE

Figure 3.--Aerial view of Jackson accident site.

About 7:30 a.m., the Jackson police chief, the first emergency responder at the accident site, arrived at the road crossing near the accident site, where the conductor of train No. F-690 gave him a listing of the derailed cars and a copy of the SBD "hazard graph" 3/ for the cars containing a hazardous commodity. The police chief stated that he also had received verbal information regarding the hazardous commodity from the SBD, which was relayed through the police dispatcher while he was en route to the accident site. The police chief proceeded to evacuate the approximately 20 residences nearby. He then relayed the hazardous commodity information to a command post that had been set up outside the evacuation perimeter. No injuries resulted from the accident. About 10 a.m., after firefighters had the tank car fires under control, the evacuees were allowed to return to their residences. The engineer and head brakeman later arrived at Augusta with the locomotive of train No. F-690 and informed SBD officials that the train had struck something on the track at Jackson.

Events Following the Accident at Jackson, South Carolina

Following the derailment of SBD train No. F-690, the crewmembers of SBD train No. F-481, en route from Florence to Augusta, were directed by the SBD dispatcher to stand by. Train No. F-481 stopped about 7:30 a.m. after proceeding through to the end of the Barnwell manual block 4/ at Robbins, South Carolina, on the Florence-Augusta main track. (See figure 1.) The engineer of train No. F-481 called the dispatcher, who told him that train No. F-690 was having trouble ahead and that he did not know how long the delay would be. About 8 a.m., the dispatcher informed the engineer of the accident, directed him to uncouple the locomotive units from train No. F-481 and move them to the rear of train No. F-690, and told him to contact the SBD official at the accident site for further instructions regarding cars to be moved from the accident site.

The crew of train No. F-481 backed their train so that its freight cars were clear of a dirt road at-grade crossing at Robbins. (See figure 4.) The cars consisted of 25 loaded and 33 empty cars and a caboose, and included 2 piggyback cars. Handbrakes were applied on several cars at the head end of the train, and the two-unit locomotive was uncoupled from the cars. The lead car was left about four or five car lengths east of the dirt road crossing, according to the crew. The cars of train No. F-481 were left in the Barnwell manual block under an absolute block 5/ authority, while the crew on the two-unit locomotive was given verbal permission by the dispatcher to proceed to the accident site at Jackson, about 14 miles west. At the accident site, the crew was instructed to pull the rear underailed portion of train No. F-690, consisting of 97 freight cars, back to a siding at Ellenton, South Carolina. (See figure 1.) After returning to the accident site, they assisted in re-railing a car and placed two freight cars and their two-unit locomotive in a siding east of the accident site. The crew then reported off duty and were taxied to Augusta, where they delivered the waybills and train consist from train No. F-481 to the trainmaster's office.

3/ The hazard graph is a computer-generated printout furnished to the locomotive and caboose crews of SBD trains carrying hazardous commodities that gives detailed information concerning the commodities and recommended procedures to follow in the event of an emergency.

4/ According to the SBD operating rules, a manual block is "A length of track of defined limits, the use of which is governed by verbal authority of the train dispatcher, or under the direction of the train dispatcher when the control station operator is not the train dispatcher."

5/ A block in which no train is permitted to enter while it is occupied by another train.

BEST COPY AVAILABLE

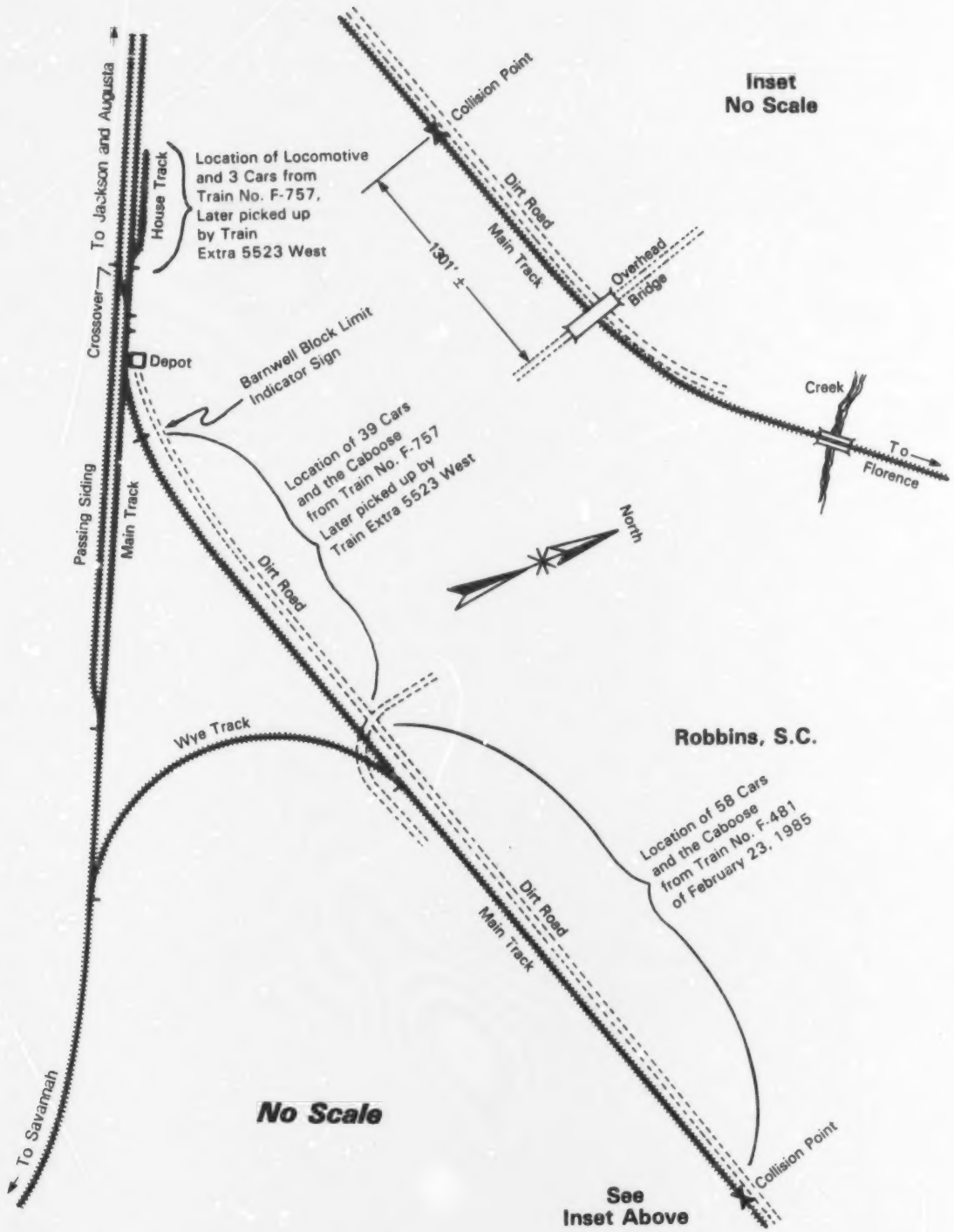


Figure 4.--Plan view of Robbins accident site.

BEST COPY AVAILABLE

Meanwhile, the crewmembers of SBD train No. F-757, consisting of 7 loaded and 35 empty cars, 1 locomotive unit, and 1 caboose and en route from Burton, South Carolina, to Augusta, had been advised of the derailment at Jackson, and were directed to stop at Robbins and put their train into the Barnwell manual block, where they were to couple onto the cars from train No. F-481 and back into the clear from the Savannah-Augusta main track. About 7 p.m., shortly after arriving at Robbins, the conductor of train No. F-757 contacted the SBD dispatcher for permission to enter the Barnwell manual block. According to the dispatcher, he granted the conductor "verbal permission to enter the Barnwell block, looking out for train F-481, now occupying the Barnwell block without protection." The crew then backed train No. F-757 onto the Barnwell manual block, with a flagman on the caboose. The flagman, using the two-way radio to communicate with the engineer, had the train stopped after sighting the cars from train No. F-481 east of the dirt road at-grade crossing, when his caboose was about three car lengths west of the crossing. The conductor later stated that at the time he believed the single-unit locomotive on train No. F-757 would be unable to push back the combined train clear of the crossing, and that he so advised the dispatcher.

At that time, the single-unit locomotive and three cars of train No. F-757 extended west of the Barnwell manual block limit board just east of the Robbins depot. After the conductor marked the location of the most westerly car on train No. F-757 that was clear within the Barnwell manual block limit, the engineer pulled the train forward to allow the flagman to get off the caboose. The train was then backed to the same location, according to the crew, and handbrakes were set on several freight cars at the west end of the train starting at the fourth head car. The single-unit locomotive and the three remaining cars were placed onto the house track west of the depot at Robbins. (See figure 4.) The cars remaining on the Florence-Augusta main track consisted of 6 loaded cars, 33 empty cars, and the caboose from train No. 757, and the 25 loaded cars, 33 empty cars, and the caboose from train No. F-481. The two "cuts" of cars were not coupled and were seperated at the dirt road at-grade crossing. The crew was then taxied from the depot at Robbins, across the dirt road at-grade crossing, and to Augusta, where they delivered the waybills and train consist from train No. F-757 to the trainmaster's office. The waybill for a placarded tank car of formaldehyde was left on the caboose of train No. F-757.

The Accident at Robbins, South Carolina

About 10 p.m., on February 24, 1985, a traincrew consisting of a conductor, engineer, brakeman, and flagman reported for duty at Augusta, where they were issued their train orders, including a copy of a handwritten work message. (See appendix C.) The work message contained instructions to the conductor and engineer to proceed to the siding near Jackson, and using the two locomotive units left there by the crew of train No. F-481, to proceed as train Extra 5523 West eastward to Robbins, where the crew was to pick up the locomotive unit and three cars left in the house track by the crew of train No. F-757 and the 32 loaded and 68 empty cars (including 2 piggyback cars) from the Barnwell manual block. The work message also contained instructions to pick up, while en route back to Augusta as train Extra 5523 West, the 97 cars from train No. F-690 that had been left at the siding at Ellenton. The work message, originated by the dispatcher at Florence, had been relayed to an operator at Augusta.

The crew was taxied from Augusta to Jackson where they picked up the two locomotive units and obtained block authority from the dispatcher to proceed as train Extra 5523 West to Robbins at about 12:15 a.m., on February 25, 1985. About 12:45 a.m. the dispatcher, after receiving a request from the conductor of train Extra 5523 West, granted permissive block authority to occupy the Barnwell manual block "looking out for

BEST COPY AVAILABLE

F-481's train occupying the main track in the Barnwell block." The dispatcher did not mention the cars left on the track by train No. F-757. The dispatcher issued the authority directly to the conductor, referencing the control station operator located at Yemassee, South Carolina; the Barnwell manual block is under the jurisdiction of the control station operator located at Florence. When the operator at Yemassee noted that fact to the dispatcher, the dispatcher replied, "Well, it don't matter that much, you just ended up with it now, far as they (Extra 5523 West) know." Shortly thereafter, the conductor queried the dispatcher as to the "paperwork on these cars we've got to pick up" and was advised that all the waybills were at Augusta. The dispatcher also advised the conductor that he wished to pass another train westbound to Augusta by Robbins on the Savannah-Augusta main track. The conductor replied that as soon as they picked up the locomotive unit and three cars in the house track they would "clear up over here in the Barnwell block."

While at Robbins, the conductor requested information concerning the placarded tank car in the house track, which the operator at Augusta then furnished to the conductor. The engineer of train Extra 5523 West backed the locomotive unit and three cars onto the main track and coupled to the two locomotive units picked up from Jackson. The three-unit locomotive and three cars were then backed and coupled onto the 39 cars at the Barnwell manual block limit board that had been left by train No. F-757. While the train's airbrake system was being charged, the flagman released the handbrakes which were set on the cars at the west end of the cut of cars left by train No. F-757. Train Extra 5523 West was then pulled forward onto the Savannah-Augusta main track, through the crossover, and onto the passing siding. (See figure 4.) No member of the crew walked eastward to the end of the cut of cars left by train No. F-757. At this time the conductor was standing outside the depot at Robbins. After the track switches were returned to the normal position, the conductor contacted the dispatcher and advised him "conductor . . . on the 5523, release all these blocks, we took the siding at Robbins, we didn't back up in that Barnwell block." The dispatcher acknowledged the transmission and noted the time at 1:30 a.m. The other westbound train was then given authority to proceed.

About 1:36 a.m., the conductor contacted the dispatcher again and advised him that they had picked up "about 40 or 50 some cars" and further that there were no piggyback cars in the pickup. The dispatcher replied to the conductor, "Well, it shows here 25 [loaded cars] and 33 [empty cars] including 2 pigs" and further "at Ellenton is where you get your big part, 90, according to what I've got here, it says 97." The dispatcher had referred to a notation written by the dispatcher on the previous shift regarding the placement of the trains to be held temporarily. The conductor stated, "OK, we came out with the cab, I presume that's the whole train," to which the dispatcher responded, "OK." The crew did not make a list of the cars in their train, nor did they perform a walking inspection or initial terminal brake test of their train as required by Federal regulation. About 2:49 a.m., train Extra 5523 West was given authority at Robbins to proceed westbound, and picked up 95 of the 97 cars at Ellenton. The remaining two cars at Ellenton were left at that location due to damage to the airbrake systems on those cars. (Train Extra 5523 West returned to Augusta about 7:25 a.m.)

Shortly after 3 a.m., the conductor of train No. F-481 of February 25, en route from Florence to Augusta, contacted the dispatcher and inquired, "Did they move the train from our side?"; the dispatcher responded, "Yeah, they finally got it." The flagman and brakeman, both of whom were on the locomotive, had been crewmembers of train No. F-481 of February 23 when the cars of that train were left in the Barnwell manual block. About 4:38 a.m., train No. F-481 of February 25 was given authority by the dispatcher to proceed through three additional blocks, including the Barnwell manual

BEST COPY AVAILABLE

block. The flagman and brakeman said that while train No. F-481 of February 25 was proceeding in the Barnwell manual block, they discussed the cars they had left in the block 2 days earlier. The engineer stated that he had put the train in dynamic braking, 6/ and was making the second application of the automatic airbrake as the train was approaching an overhead bridge east of Robbins. (See figure 4.) The engineer said that the speed of the train had been reduced from 49 mph to about 40 mph; at that time the train was in a 2°30' curve to the right and on a variable descending grade of about 0.5 percent. As the locomotive neared the overhead bridge, the flagman and brakeman, both seated on the left side of the locomotive control cab, simultaneously saw a caboose and cars ahead of them on the single main track. The engineer immediately placed the automatic airbrake into emergency application. The flagman and brakeman both exited the locomotive control cab through the left-side front door; the flagman jumped off the front platform on the right side while the brakeman jumped off the front platform on the left side. The engineer exited the locomotive cab through the right-side rear door and jumped off the rear platform on the right side. About 7:50 a.m., train No. F-481 of February 25 struck the rear of the standing cut of cars left by train No. F-481 of February 23.

After train No. F-481 of February 25 came to a stop, the conductor attempted to radio the engineer. When he received no answer he began walking forward, and after he had walked about half the train's length, the flagman called the conductor on his portable radio. The flagman requested the conductor to summon emergency assistance. Shortly after arriving at the collision point, the conductor succeeded in contacting a train near Robbins, the crew of which contacted the dispatcher about 8:25 a.m. to summon emergency assistance. The first emergency personnel arrived about 9:05 a.m.; the injured flagman, brakeman, and engineer were treated at the site and then transported to a hospital in Augusta. The accident resulted in the derailment of the lead locomotive unit of train No. F-481 of February 25 and the caboose and one car of the standing cut of cars. (See figures 5 and 6.)

Injuries to Persons

	Train No. 690	Train No. 481	Total
Fatal	0	0	0
Serious	0	3	3
Minor	0	0	0
None	4	1	5
Total	4	4	8

Damage

After the accident at Jackson, a cushion unit 7/ was found near the initial derailment. The unit's male portion (piston) was found inside the track gage (see figure 7) while the female portion (cylinder) was found outside the track gage (see figure 8). About 5 hours before the accident, train No. F-480 containing boxcar SBD 156678, passed through Jackson. A postaccident inspection of boxcar SBD 156678 at Sumter

6/ Dynamic braking is a term used to describe a method of train braking whereby the kinetic energy of a moving train is used to generate electric current at the locomotive traction motors, which is then dissipated through banks of resistor grids in the locomotive car body.

7/ A cushion unit is an energy-absorption device installed on cushion-underframe railcars to minimize the effects of compressive and tensile forces in a train which can damage lading and equipment.

BEST COPY AVAILABLE

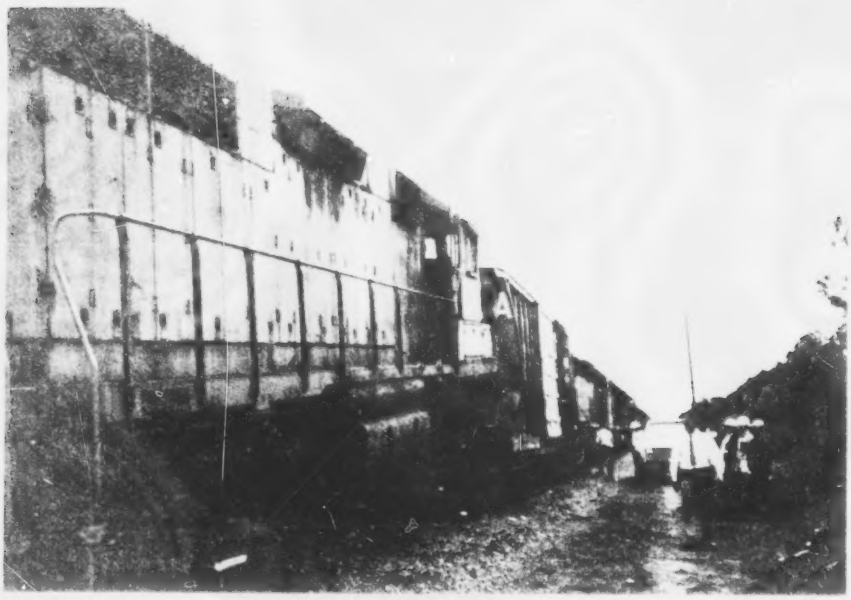


Figure 5.--View of lead locomotive unit of SBD train No. F-481 of February 25 after collision at Robbins accident site.

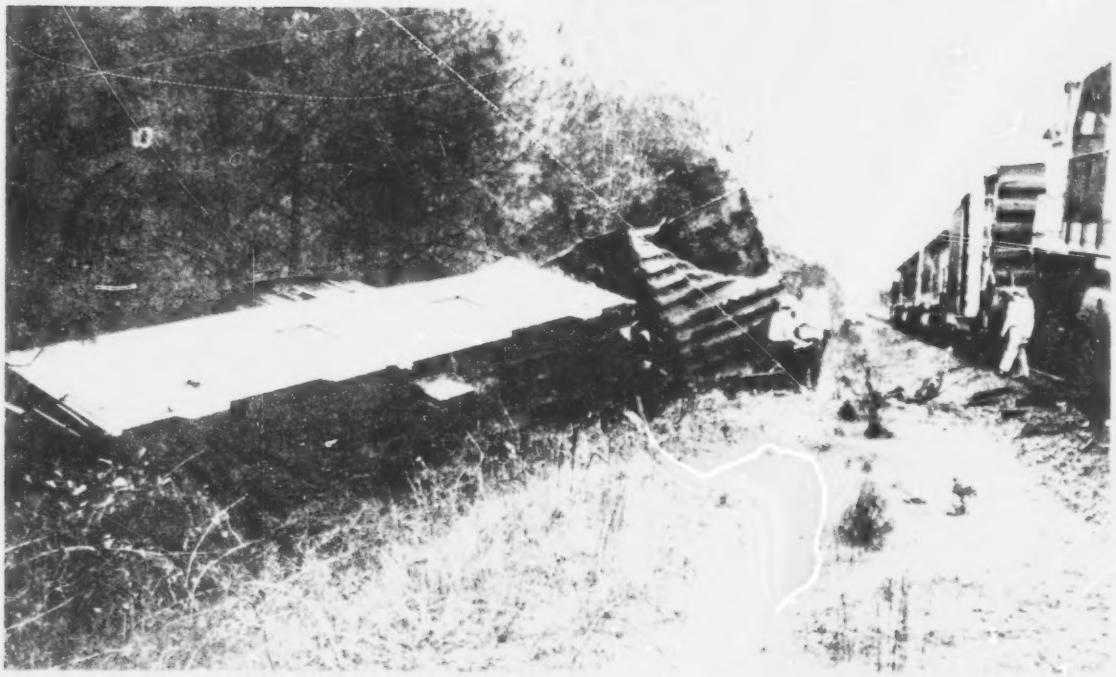


Figure 6.--View of derailed caboose and boxcar of standing cut of cars after collision at Robbins accident site.

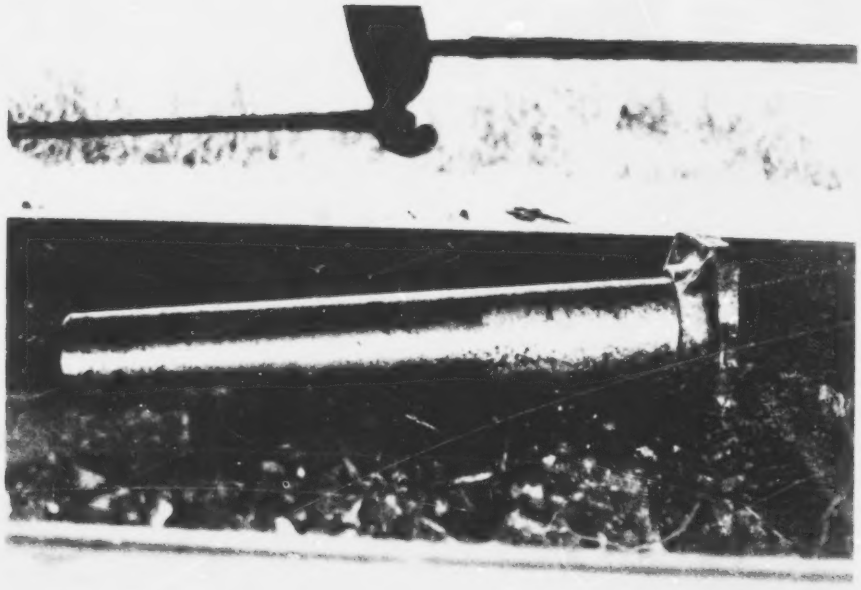


Figure 7.--Cushion unit piston found inside the track gage at Jackson.

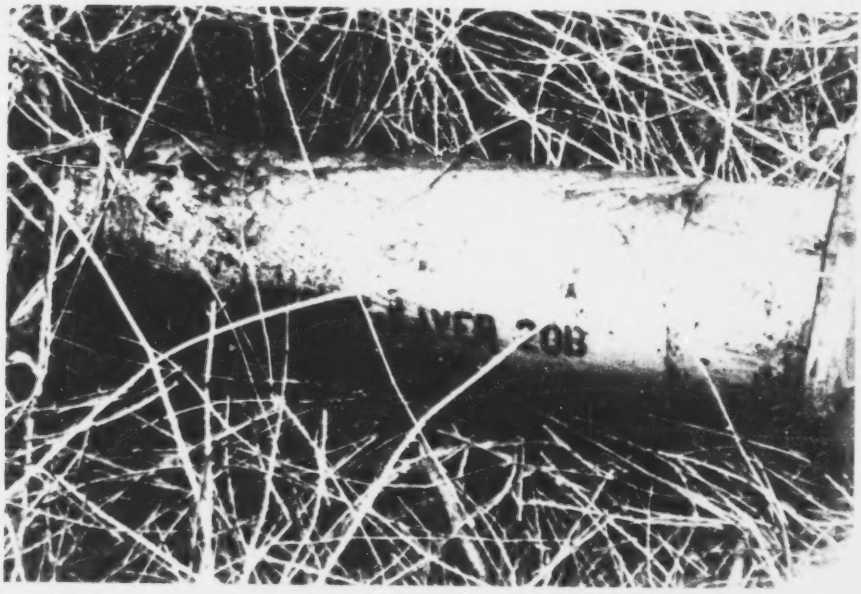


Figure 8.--Cushion unit cylinder found on south side of track at Jackson.

revealed among other damage that the cushion unit and a brake rod were missing. The support plate assembly which retains the cushion unit was missing, and portions of only three securement bolts were found in place. The brake rod from boxcar SBD 156678 later was found just east of the site where train No. F-690 derailed.

In the accident at Jackson, 27 cars were derailed, 25 of which were destroyed. All eight tank cars laden with cyclohexane were among the destroyed cars. The heads of five of the eight tank cars were penetrated during the derailment. (See figures 9 through 13.) All of the tank cars were equipped with type-"F" top-and-bottom shelf couplers, virtually all of which were broken or torn from their yokes. None of the tank cars was equipped with head shields, nor were they required to be so equipped by Federal regulation, notwithstanding the fact that the Emergency Response Guidebook published by the U.S. Department of Transportation (DOT) recommends evacuation of a one-half mile radius when a tank car of cyclohexane is involved in fire. About 900 feet of single main track and roadbed were destroyed in the accident. Damage was estimated by the SBD to be as follows:

Equipment	$ 778,810
Lading	312,000
Track	22,000
Wreck clearing	29,323
Environmental restoration	150,000
Total	$1,292,133

In the accident at Robbins, the caboose and the boxcar forward of the caboose in the standing cut of cars were destroyed, while another boxcar was moderately damaged. The lead locomotive unit of train No. F-481 of February 25 was severely damaged. Damage was estimated by the SBD to be as follows:

Equipment	$ 64,400
Lading	
Track	
Wreck clearing	2,055
Total	$ 66,455

Personnel Information

Traincrews.--The engineers, conductors, brakemen, and flagmen on SBD trains No. F-690 on February 23, 1985; No. F-481 on February 23, 1985; Extra 5523 West on February 24, 1985; and No. F-481 on February 25, 1985, were qualified by the SBD for their respective positions, and all were current on SBD operating rules. (See appendix B.)

Dispatchers.--The dispatcher position controlling train movements at Jackson and Robbins is located at Florence. Three dispatchers worked the position within the timeframes involving train movements after the derailment at Jackson at 7:15 a.m. on February 23, 1985, and up to the collision at Robbins at 7:50 a.m. on February 25, 1985. (See appendix B.)

Dispatcher No. 1, who worked from 4 p.m. to midnight on February 23, 1985, stated that the cars from train No. F-481 of February 23 were in the Barnwell manual block with an absolute block authority during his tour of duty. He stated that a message from the chief dispatcher contained instructions that when train No. F-757 arrived at Robbins,

BEST COPY AVAILABLE

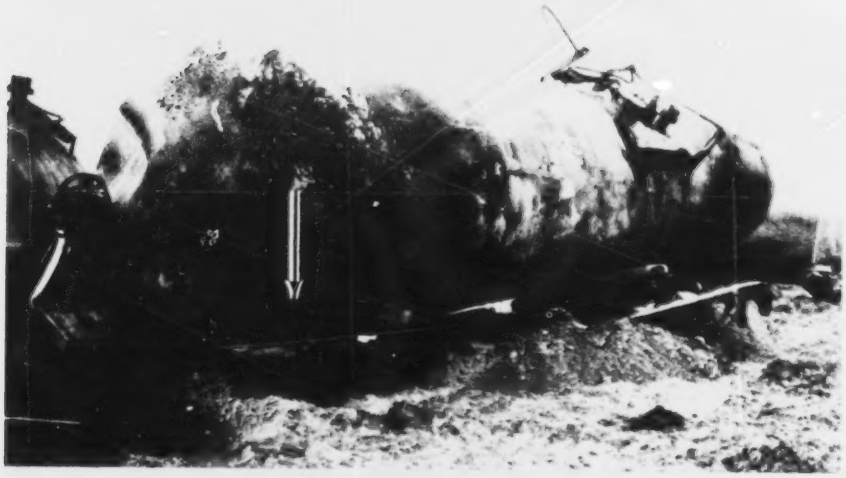


Figure 9.--Tank car ACFX 77757 in the Jackson accident.

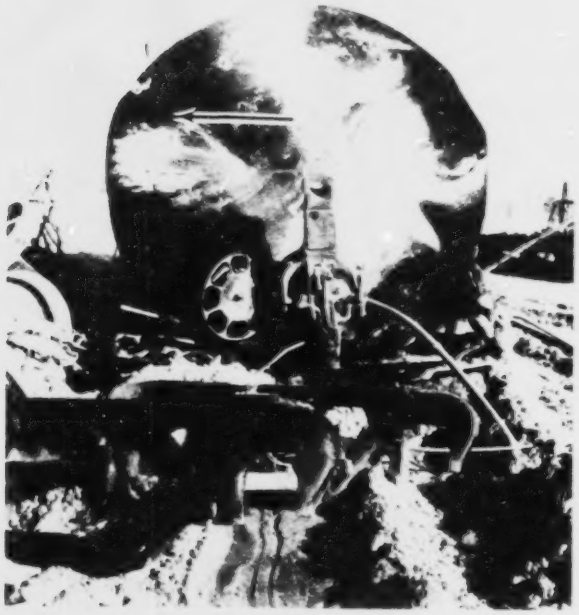


Figure 10.--Tank car ACFX 77725 in the Jackson accident. Note penetrated area of tank head shown at arrow.

Figure 13.--Tank car ACFX 77711 in the Jackson accident.
Note penetrated area of tank head shown at arrow.

the traincrew was to couple their train in the Barnwell manual block to the cars left by train No. F-481. When train No. F-757 arrived at Robbins, the dispatcher gave verbal permission to enter the Barnwell manual block. After the traincrew completed their work, the verbal permission was released. The dispatcher noted on the manual block sheet the time that verbal permission was granted as being 7:06 p.m., and the time of release as being 7:40 p.m. After the verbal permission was released, the dispatcher highlighted the entries on the manual block sheet using a green-colored, wide felt-tip marking pen. The dispatchers at Florence normally highlight entries on the manual block sheet to indicate that a train has cleared and no longer occupies a block. The entry for the cars from train No. F-481 was not highlighted. The dispatcher stated that at the end of his tour of duty, during the transfer to the relieving dispatcher, he called attention to the presence of train No. F-757 in the Barnwell manual block and the house track at Robbins. He also stated that this information was not put into writing and that only the cars from train No. F-481 were noted in writing as being in the Barnwell manual block.

The dispatcher who worked from 8 a.m. to 4 p.m. on February 24 did not have to coordinate any train movements at Jackson or Robbins because the track at the Jackson accident site had not yet been restored to service.

Dispatcher No. 2, who worked from midnight to 8 a.m. on February 24, stated that the tour of duty was uneventful due to the derailment at Jackson having blocked the main track.

Dispatcher No. 3, who worked from 4 p.m. to midnight on February 24, stated that the main track at Jackson was reopened for service about 8 p.m. during his tour of duty. The dispatcher issued the work message (see appendix C) for the conductor and engineer of train Extra 5523 West through the control station operator at Augusta; however, the dispatcher did not write out and retain a copy of the message in the dispatcher's office. He stated that he added together the number of cars that were reported left in the Barnwell manual block by the crews of train Nos. F-481 and F-757, and that he thought all of the cars had been left in a single coupled cut of cars. The dispatcher stated that only the cars from SBD train No. F-481 were noted on the manual block sheet for February 24.

Dispatcher No. 2 worked from midnight to 8 a.m. on February 25, during which time train Extra 5523 West operated. The dispatcher stated that he entered on the manual block sheet that the Barnwell manual block was clear at 1:30 a.m., after the conductor of Extra 5523 West released the blocks. About 1:36 a.m., the conductor contacted the dispatcher regarding the car count discrepancy, at which time the dispatcher read back to the conductor that portion of information he had regarding the cars of train No. F-481 of February 23. When asked by Safety Board investigators why he did not read to the conductor that portion of information regarding train No. F-757, he stated "I just didn't do it. I mean, I just didn't get that far along. With everything transpiring at the time, I didn't read far enough down again to give it to him."

Train Information

The locomotive of train No. F-690 consisted of five diesel-electric units: SBD 7000, SBD 1550, SBD 8064, SBD 1255, and SBD 8210. The lead unit was a model C 30-7, 3,000-horsepower, six-axle unit manufactured by the General Electric (GE) Company. The second unit was a model U30-C, 3,000-horsepower, six-axle unit also manufactured by GE. The remaining units were model SD 40-2, 3,000-horsepower, six-axle units manufactured by the Electromotive Division (EMD) of General Motors Corporation. The locomotive and caboose were equipped with operable radios. The locomotive was equipped with a 26-L airbrake system, dynamic brakes, and speed indicators. At the time of the accident, the train contained 27 loaded and 121 empty cars and a caboose, had a trailing tonnage of 6,898 tons, and was about 9,645 feet long.

The locomotive of train No. F-481 of February 25 consisted of two diesel-electric units: SBD 6239 and SBD 4059. The lead unit was a model GP-38 and the trailing unit was a model GP 38-2; both were 2,000-horsepower, four-axle units, manufactured by EMD. The locomotive and caboose were equipped with operable radios. The locomotive was equipped with a 26-L airbrake system, dynamic brakes, and speed indicator. At the time of the accident, the train contained 37 loaded and 59 empty cars and a caboose, had a trailing tonnage of 5,200 tons, and was about 5,000 feet long.

Method of Operation

Trains are operated through the Jackson and Robbins areas by timetable, special instructions, and by verbal instructions of control station operators or dispatchers by radio or wayside telephone to the conductors and/or engineers of trains. The SBD defines the method of operating trains as a Manual Block System. The main tracks at Jackson and at Robbins are not signalized. The SBD timetable stipulates a maximum permitted track speed of 49 mph in the Jackson and Robbins areas.

BEST COPY AVAILABLE

The following are excerpted from the SBD Rules of the Operating Department, in effect at the time of the accident:

MANUAL BLOCK RULES

135. A Manual Block System is used on portions of the railroad designated in timetable or by special instructions. Within a Manual Block System, trains will be governed by verbal instructions of the control station, and such instructions supersede the superiority of trains for both opposing and following movements on the same track, but do not dispense with the use or observance of other signals or of train orders whenever and wherever they may be required. The control station must be advised in advance of any known condition that will delay a train or prevent it from making maximum authorized speed.

136. The block(s) with a Manual Block System will be established by timetable or special instructions.

* * *

139. One of the following types of blocks will be granted for trains in the Manual Block System:

(a) Absolute Block -- A block in which no train is permitted to enter while it is occupied by another train.

NOTE -- An Absolute Block must not be granted where "Yard Limits" are located within a Manual Block.

(b) Clear Block -- A block clear of opposing and preceding trains through which trains of a designated direction will be operated.

(c) Permissive Block -- A block clear of opposing trains but not clear of preceding trains through which trains of designated direction will be operated. Trains receiving a permissive block will run expecting to find preceding train protecting itself as required by Rule 99.

NOTE -- Rules 99 and 99-A apply within a Manual Block System. Control station may grant relief from rear end flag protection, and such relief may be granted for a designated time. When a train has a Clear or Permissive Block and has been relieved from providing rear end flag protection, back up movements must be made at Restricted Speed in order to protect against:

(1) Another train in the opposite direction within the block; and

(2) Following on-track equipment.

* * *

BEST COPY AVAILABLE

149. After a train clears the block(s) authorized, conductor or engineer must promptly report "Clear" to the control station. When clearing the block at a point where switch must be returned to normal position, "Clear" must not be reported until switch has been secured in normal position. A train occupying a block on Clear or Permissive block authority must not clear the main track without reporting "Clear" to the control station. Trains must not re-enter a block after reporting "Clear" except by again securing authority to occupy the block.

150. The train dispatcher and control station will maintain permanent written records pertinent to handling of any movement within the Manual Block System, including train or track equipment identity, block(s) authorized, type and time block(s) authorized, time block(s) cleared, initials and name of train crew member or on-track equipment operator who transmits block information.

* * *

153. The following additional requirements will apply to trains being operated under Manual Block authority in non-signaled territory only:

(a) Trains operating on Permissive Block authority must proceed prepared to stop within one-half the range of vision, but not exceeding 20 mph;

* * *

TRAIN DISPATCHERS

815. Train dispatchers report to the chief dispatcher.

816. They will issue train orders governing the movement of trains and will see that they are transmitted, recorded, and repeated according to the prescribed forms and rules when applicable. They will keep a record of the movement of trains. They will note on train sheet important incidents occurring during their tour of duty and will keep the various other records required.

They are responsible for directing the movement of trains in a manner that will provide a safe operation, avoid unnecessary delays, and be in compliance with the rules and special instructions. They must anticipate the need for train orders and have them ready when needed.

* * *

827. Train dispatchers must give instructions in such a manner so that they will not be misunderstood. It is the train dipatcher's duty to take the initiative, insofar as it lies within his power, to see that trains move safely, to anticipate hazardous conditions, and to avoid issuing instructions or train orders that might cause an accident due to confusion or misunderstanding. It is not enough for train dispatchers alone to understand their instructions; they must be worded so clearly that others cannot misunderstand them.

BEST COPY AVAILABLE

As trains are dispatched, the dispatcher on duty enters onto a "Dispatcher Record of Movements of Trains" and a "Manual Block Sheet" the times and block locations and type of block authority granted. Since the involved locations are not signalized, the dispatcher does not have a model board to aid in establishing the location of various trains and relies on the information supplied from the traincrews to determine when a block has been cleared. As trains move through and release the block occupancy authority, the dispatcher enters the time at which the train crew notifies him of the release, and highlights the entry with a green-colored, wide felt-tip pen. In the instance of a train not clearing a block by midnight of a given day, that occupancy is carried over and noted onto the manual block sheet for the subsequent day. Communications among the dispatcher, control station operators, and train crewmembers are achieved by the use of radios and wayside telephones.

In a deposition proceeding conducted by the Safety Board on March 27 and 28, 1985, various crewmembers said that the permanent radios on SBD cabooses did not function satisfactorily in the majority of times they attempted to use them. The crewmembers said that it was often necessary to communicate with the dispatcher using the permanent radio unit on the locomotive, and relaying the transmission to the rear-end crew via their portable radio units. The crewmembers also said that it was often necessary to stop trains in order to use the wayside telephones located at block limit sites.

At the Safety Board's deposition proceeding, the SBD chief dispatcher for the Florence Division was asked for his supervisory evaluation of the capabilities of the three dispatchers involved in the movements of trains at Robbins between February 23, 1985, and February 25, 1985. With regard to dispatcher No. 1, who worked from 4 p.m. to midnight on February 23, the chief dispatcher stated " he's weak comparatively speaking. He is not a first-rate train dispatcher." The chief dispatcher also stated, "He just doesn't extend himself. In other words, I feel like [dispatcher No. 1] does what's there to be done, but he doesn't see anything beyond what's coming at him." With regard to dispatcher No. 3, who worked from 4 p.m. to midnight on February 24, the chief dispatcher stated, "He has a good head but he is a sloppy worker, very sloppy. His handwriting is deplorable and he's involved in other activities." (The "other activities" was a reference to the dispatcher's involvement in a self-owned small business in which the dispatcher stated he worked about 5 hours per week.) The chief dispatcher also stated, "I don't think he comes to work in his best condition and therefore his performance is just not up to par." With regard to dispatcher No. 2, who worked from midnight to 8 a.m. on February 24 and February 25, the chief dispatcher stated, "I would consider him very average to less. He's just not a standout train dispatcher." The chief dispatcher said that even given his evaluation of these dispatchers he did not make any special efforts in terms of supervision when train No. F-690 derailed and the subsequent unusual dispatching events occurred.

At the Safety Board's deposition proceeding, the SBD Florence Division Master Mechanic, when asked as to the airbrake test that should have been conducted when train Extra 5523 West picked up the cars in the Barnwell manual block, stated that "an initial terminal brake test was required." He further stated that the initial terminal brake test was required by "FRA [Federal Railroad Administration] regulation." (The FRA has advised the Safety Board that no report of violation has been filed against the SBD in this regard.) With regard to the comments by various crewmembers indicating that permanent radios on SBD cabooses did not function in the majority of times, the master mechanic stated that complaints were received from crewmembers in "more like 25 percent" of those instances.

BEST COPY AVAILABLE

Track Information

At the accident site at Jackson, the single main track is constructed of 115-pound RE section jointed rail. The rails are laid on double-shouldered tie plates atop 7-inch by 9-inch by 8-foot 6-inch treated hardwood crossties. The crossties are laid in crushed granite ballast with compacted full tie-cribs. The ballast section extends 6 inches below the tie bottoms and more than 12 inches beyond the tie ends. The track is tangent (straight) and generally level. The track meets or exceeds the minimum standards of the FRA track safety standards for class 4 track.

At the accident site at Robbins, the single main track is of the same construction and quality as at Jackson. However, approaching the accident site in a westward direction, the track proceeds through a 2°30' curve to the right, about 1,255 feet in length, then proceeds tangent. About 219 feet before the end of the curve, the track is under an overhead highway bridge. The track profile descends at a 0.5-percent grade to the accident site. Dense trees and foliage line both sides of the track.

Meteorological Information

At the time of the accident at Jackson, visibility was good, the temperature was about 52° F, the relative humidity was about 90 percent, and the winds were from the west at about 3 knots. There was no precipitation.

At the time of the accident at Robbins, visibility was good, the temperature was about 59° F, the relative humidity was about 95 percent, and the wind was calm. There was no precipitation.

Medical and Pathological Information

No one was injured as a result of the accident at Jackson.

The engineer, brakeman, and flagman on train No. F-481 which struck the standing cars on the main track at Robbins sustained injuries as a result of jumping from the moving train before the collision. The engineer received abrasions of the right chest area and right arm, laceration of the back of the head, a severely sprained right ankle and bruised foot. The flagman received a cervical (neck) sprain, contusion of the left femur, and laceration of the right hand. The brakeman received contusions of the lower back and left knee, and a sprain of the right ankle.

Tests and Research

Postaccident inspections of the components of the track structure at the Jackson and Robbins accident sites disclosed no defects that would have contributed to either accident.

Postaccident inspection revealed that boxcar SBD 156678, which had been in a train passing through Jackson about 5 hours before the accident there, was missing its cushion unit and a brake rod. Those items were found near the accident site. The support plate assembly which retains the cushion unit was not found.

BEST COPY AVAILABLE

On December 4, 1984, the original cushion unit on boxcar SBD 156678 was replaced with a cushion unit at the SBD's mechanical repair shop at Charlotte, North Carolina. According to Rule 59 of the Field Manual of the Association of American Railroads (AAR) Interchange Rules, the replacement unit, designated as a FREIGHT-SAVER 20B and manufactured by the Joy Manufacturing Company (Joy), was an acceptable replacement unit for the original HYDROFRAME 40 unit, which had been manufactured by Pullman Standard, Inc. (Pullman Standard). The primary dimensional difference between the units is in the unit end caps; the HYDROFRAME 40 end cap thickness is a nominal 2 1/2 inches while the FREIGHT-SAVER 20B end cap thickness is a nominal 1 7/16 inches. The cushion unit is located within a pocket in the centersill of the car and secured by a steel carrier plate affixed with 16 bolts. At Charlotte, the existing bolts were burned off with a torch, the carrier plate was removed, and the failed HYDROFRAME 40 unit was replaced with the FREIGHT-SAVER 20B unit later found at the accident site. The carrier plate was then reinstalled using 16 hex-head common bolts to which torque was applied in place with an impact air-wrench. The boxcar then was returned to revenue service.

Boxcar SBD 156678, which originally was built by Pullman Standard, was one of a series of similar cars manufactured for a predecessor of SBD in 1967 and 1968. A design modification performed by Pullman Standard in 1967 consisted of shortening one end of the carrier plate approximately 5/8 inch, welding a length of angle iron to the shortened end of the carrier plate, and bolting a 5/8-inch spacer shim to the angle iron. The bolt holes in the carrier plate also were elongated to facilitate installation of the carrier plate to the fixed sill of the railcar. The modification was performed to improve the service characteristics of the cushion unit. The SBD personnel who performed the December 4, 1984, repairs at Charlotte could not recall with certainty whether that modification had been performed on boxcar SBD 156678. Further, the carrier plate was not found after the accident.

After the accident, the SBD forwarded boxcar SBD 156678 to its testing facility and heavy repair shops located at Waycross, Georgia. The car was restored to the same condition that it was reported to be in before the derailment. A new carrier plate was fabricated in accordance with Pullman Standard drawings. The drawings did not indicate the addition of the angle iron or the spacer shim; however, they did indicate that the carrier plate had been shortened by 5/8 inch at one end. The carrier plate was installed using 16 hex-head common bolts. During the test procedures, boxcar SBD 156678 was struck from both ends to simulate train service conditions. After several impacts the gas pressure in the cushion unit had reduced; the cushion unit's pressurization provides the unit with the capability to center itself and the car's sliding sill apparatus. With additional reduction and further impacts, the unit demonstrated a loss of centering ability. After further impacts, the cushion unit end cap wedged between the fixed draft stop and the carrier plate at the plate's shortened end. The next impact resulted in the shearing of 1 of the 16 bolts and canting of the remaining bolts in the elongated bolt holes in the carrier plate. The next impact resulted in the shearing of the remaining bolts, and the loss of the carrier plate. Further movement of boxcar SBD 156678 resulted in the loss of the cushion unit, which fell into the track gage.

During a review of these test procedures with representatives from Pullman Standard, Joy, the SBD, the FRA, and Safety Board investigators, Pullman Standard advised that askew-head, high-strength bolts or high-strength bolts with wedged washers are specified and should be used in order to properly compensate for the fixed-sill flange taper in securing the carrier plate in place. At the time, it was noted that the cushion

BEST COPY AVAILABLE

unit pocket was 1 inch longer than specified in construction drawings (see figure 14), and that the car showed signs of previous heavy repair or overhaul. However, the Pullman Standard representative stated that the permissible dimensional tolerances of such equipment within specification could result in a gap of 1 7/16 inch between the fixed draft stop and the shortened end of a modified carrier plate. The SBD was unable to determine the repair history of boxcar SBD 156678 with regard to the previous heavy repair or overhaul of the underframe of the car.

Pullman Standard said that since 1967 it has built about 12,000 freight cars with similarly configured cushion units. Pullman Standard and Joy also stated that a normal service life cycle for the cushion unit is 10 or more years.

The SBD has advised the Safety Board that it has begun inspecting all of its freight cars that might have had the Pullman Standard cushion unit replaced with a Joy cushion unit, and in such cases where replacement had occurred, the SBD will replace the carrier with a longer carrier plate designed to eliminate any gap between the plate and the fixed draft stops. The SBD also has advised the Safety Board that it recommended to the AAR that a letter be sent to all its member railroads advising them of the circumstances regarding the cushion unit replacement.

After the accident at Jackson, the locomotive of train No. F-690 was taken to Augusta, a distance of about 14 miles. The five-unit locomotive was inspected at Augusta, but was not placed over the locomotive inspection pit located there during that inspection. The inspection revealed no damage to the locomotive of train No. F-690, and the locomotive units were placed back into revenue service. However, a later inspection on February 24, 1985, by FRA inspectors at Erwin, Tennessee, working in conjunction with

Figure 14.--Cushion unit pocket on boxcar SBD 156678

BEST COPY AVAILABLE

Safety Board investigators,revealed that three of the locomotive units sustained strike marks and damage on traction motors and end plates; one locomotive unit had crosstie pieces wedged between a traction motor and housing; and only one locomotive unit showed no signs of contact with a foreign object in the track. The minimum clearance above the top of rail measured at 4 inches on the front pilot on the locomotive of train No. F-690; the minimum clearance above the top of rail measured at 4 inches on the locomotive traction motors.

The locomotive of train Extra 8523 East, which passed through Jackson about 2 hours before the accident also was measured for clearance. The minimum clearance above the top of rail measured at 4 1/2 inches on the front pilot; the minimum clearance above the top of rail measured at 6 inches on the locomotive traction motors.

A sight distance test was performed on March 16, 1985, at the Robbins collision location. Representatives from the SBD, the FRA, and the Safety Board participated in the sight distance test, which took place between about 7 a.m. and 7:45 a.m. The visibility conditions were generally comparable to those at the time of the accident at Robbins. The participants agreed that they could first see the caboose, which had been pre-positioned at the collision point, when the locomotive they were riding was about 1,332 feet from the caboose.

The SBD performed stopping distance tests, using its Train Dynamics Analyzer 8/ to determine the calcuated stopping distances for train No. F-481. Five separate tests were performed using emergency or full service brake application simulations at varying speeds, with the train having been in dynamic braking, as follows:

	Brake application	Speed (mph)	Stopping distance (feet)
Test 1	Emergency	37.3	940
Test 2	Emergency	44.4	1,280
Test 3	Emergency	43.8	1,320
Test 4	Emergency	41.8	1,180
Test 5	Full Service	43.8	2,700

The test figures reflect stopping distances achieved as a result of mechanical/pneumatic reaction time and brake propagation, but do not take human reaction time into account.

Other Information

On May 2, 1985, the SBD delivered in interchange to the Southern Railway Company (SOU) at Inman Yard in Atlanta, Georgia, a loaded covered hopper car, SAL 32450. On May 3, 1985, an SOU repair track foreman telephoned an SBD repair track foreman to inform him that covered hopper car SAL 32450 had a defective draft lug 9/ and to inquire as to that car's disposition. The SOU repair track foreman stated that on May 7, 1985, he placed "Home Shop" repair tags on the car; covered hopper car SAL 32450 was returned empty on May 13, 1985, after being unloaded to the SBD at Tilford Yard in Atlanta.

8/ The Train Dynamics Analyzer is a computer program designed to define dynamic forces within a train interacting on the track structure under given climatic conditions, train handling, train makeup, gradients, and track curvature.

9/ A draft lug is one of a set of stops riveted, bolted, or welded to the draft sills and transmitting to them the stresses received from the draft gear. The latter lies between the draft sills, and the ends of its follower plates bear against shoulders on the lugs.

BEST COPY AVAILABLE

On May 14, 1985, covered hopper car SAL 32450 was waybilled for loading and placed into SBD train No. A-632-14, destined for Waycross. The train was inspected by SBD car inspectors at Tilford Yard. About 5 a.m. on May 15, 1985, five cars of SBD train No. A-632-14 derailed in Montezuma, Georgia. According to the SBD, the rear draft lug from the "A" 10/ end of covered hopper car SAL 32450 fell from that car and lodged in the frog 11/ of a track turnout, precipitating the derailment. Although there were no injuries, railroad damage was estimated at about $91,100, and private property damage to buildings along the track was estimated at about $291,000, for a damage total of about $382,100.

The "Home Shop" tags were found still affixed to covered hopper car SAL 32450 after the derailment. The tags indicated, however, that the defective draft lug was at the "B" end of the car.

The following are excerpts from Title 49 of the Code of Federal Regulations:

§215.13 Pre-departure inspection.

(a) At each location where a freight car is placed in a train, the freight car shall be inspected before the train departs. This inspection may be made before or after the car is placed in the train.

(b) At a location where an inspector designated under §215.11 is on duty for the purpose of inspecting freight cars, the inspection required by paragraph (a) of this section shall be made by that inspector to determine whether this car is in compliance with the part.

* * *

§215.11 Designated inspectors.

(a) Each railroad that operates railroad freight cars to which this part applies shall designate persons qualified to inspect railroad freight cars for compliance with this part and to make the determinations required by §215.9 of this part.

(b) Each person designated under this section shall have demonstrated to the railroad a knowledge and ability to inspect railroad freight cars for compliance with the requirements of this part and to make the determinations required by §215.9 of this part.

10/ The "A" end of a car is that end of the car opposite the end of that car at which the handbrake is located. The "B" end of a car is that end of the car at which the handbrake is located.

11/ A frog is a track structure used at the intersection of two running rails to provide support for wheels and passageways for their flanges, thus permitting wheels on either rail to cross the other.

BEST COPY AVAILABLE

(c) With respect to designations under this section, each railroad shall maintain written records of:

(1) Each designation in effect; and
(2) The basis for each designation.

* * *

§215.9 Movement of defective cars for repair.

(a) A railroad freight car which has any component described as defective in this part may be moved to another location for repair only after the railroad has complied with the following:

(1) A person designated under §215.11 shall determine:
(i) That it is safe to move the car; and
(ii) The maximum speed and other restrictions necessary for safely conducting the movement.

The FRA has advised the Safety Board that a report of violation has been filed against SBD in regard to the operation of the railcar with the defective draft lug.

ANALYSIS

The Jackson, South Carolina Accident

The operating crews of trains No. F-480, Extra 8532 East, and No. F-690 were qualified for their respective positions in accordance with SBD requirements. There were no mechanical defects found in train No. F-690 that would have contributed to the accident. Further, there were no defects noted in the track structure that would have contributed to the accident.

The markings on the pilots and traction motors of three of the locomotive units and the crosstie pieces found under another unit substantiate the statements of the head-end crew of train No. F-690 that they heard and felt the locomotive strike an object on the track at Jackson. Whether the struck object, the cushion unit that fell from boxcar SBD 156678 about 5 hours earlier, subsequently was impelled against the track structure with sufficient force to violate the track structure integrity, or whether the cushion unit came to rest against a running rail, thereby obstructing the flangeway, could not be determined due to the severity of damage from the derailment and fire. Although the minimum clearance above the top of rail was only one-half inch less on the locomotive of train No. F-690 than on the locomotive of train Extra 8532 East, which passed through Jackson 2 hours earlier, that difference apparently was sufficient to cause the dropped cushion unit to be struck by train No. F-690, and not by train Extra 8532 East. Further, although the crew of train No. F-480 which contained boxcar SBD 156678, received a dragging equipment indication at Jackson, the Safety Board believes that it is understandable that the crew did not take exception during their inspection of the train. That inspection occurred after 2 a.m. in the dark, the cushion unit had fallen a considerable distance west of where train No. F-480 had stopped, and the brake rod from boxcar SBD 156678 could have been easily overlooked.

BEST COPY AVAILABLE

The Safety Board believes that the sequence of events produced during the postaccident tests performed on boxcar SBD 156678 at Waycross, wherein the cushion unit end cap wedged between the fixed draft stop and the carrier plate at its shortened end, was probably the same sequence which resulted in that boxcar dropping the cushion unit at Jackson. Although SBD 156678 was not in compliance with manufacturer specifications, permissible dimensional tolerances of the cushion unit equipment can result in a gap of 1 7/16 inches between the fixed draft stop and the shortened end of a carrier plate and the cushion unit end cap is only 1 7/16 inches thick which permits the end cap to wedge itself between the fixed draft stop and a carrier plate. Once this occurs, the dynamic forces of slack action 12/ on a freight car will be transmitted to the carrier plate, resulting in sheared retaining bolts. The carrier plate and cushion are then free to drop onto the track. During its investigation the Safety Board became concerned that similar failures in other cushion-underframe freight cars that are in compliance with manufacturer specifications had the same potential for derailments with catastrophic results. The Board's concern led to the issuance of Safety Recommendations R-85-86 and R-85-87 on August 12, 1985, to the AAR and the American Short Line Railroad Association respectively, which state:

> Urge its membership to inspect promptly all cushion underframe freight cars which have had original equipment Pullman Standard, Inc., cushion underframe units replaced with Joy Manufacturing Company cushion underframe units to determine whether carrier plates are fitted which eliminate any gap between the carrier plate and the fixed draft stops and to install longer plates where necessary. Provide the Safety Board a report of the number of freight cars found by each member railroad to require longer carrier plates and an estimated completion time for replacement.

The Safety Board is currently reviewing the responses to this recommendation. However, the SBD's program to inspect all of its freight cars that might be affected and to replace carrier plates with longer carrier plates designed to eliminate any gap between that plate and the fixed draft stops is commendably prompt action in the interest of safety.

As the cars of train No. F-690 derailed, they began to jackknife and disperse laterally. Although the tank cars carrying cyclohexane were equipped with type-"F" top-and-bottom shelf couplers, it is evident that these were not sufficient protection alone in this high-speed derailment; the tank heads of five of the eight tank cars were penetrated. Had these cars been equipped with head shields, it is likely that the penetrations and subsequent releases of hazardous materials from those penetrations would not have occurred. While head shields would not have prevented penetrations on other portions of the tank cars, product loss would have been substantially minimized, easing the efforts of emergency response personnel, and the threat to life and property would have been minimized. The response to the accident by local emergency response personnel was prompt, efficient, and well organized. Further, the conductor of SBD train No. F-690 promptly furnished the emergency responders with the data necessary for them to assess and contain the emergency as well as possible.

12/ Slack action is created when one portion of a train moves faster or slower relative to an adjacent portion of the train. When this difference in speed has taken up all slack (a run-in or run-out), these adjacent portions of the train suddenly attempt to attain a uniform speed, resulting in potentially damaging shock forces.

BEST COPY AVAILABLE

Unacceptable Risks Posed By Inadequately Safeguarded Tank Cars

Detailed inspection of the tank cars involved in the accident at Jackson indicate that the type-"F" top-and-bottom shelf couplers absorbed substantial amounts of initial impact; however, the shelf couplers alone were not sufficient as a protective system in this high-speed derailment. The Safety Board's position regarding the demonstrated need for additional protective systems on tank cars carrying high-risk hazardous commodities has been corroborated in numerous accident investigations. (See appendix D.) As a result of a Safety Board hearing held on April 4-6, 1978, 13/ the Board recommended expedited rulemaking actions (Safety Recommendations R-78-19 and R-78-20) to require installation of head shields and shelf couplers on DOT specification 112A and 114A cars. Those tank cars since equipped with both head shields and shelf couplers which have been involved in derailments have demonstrated the effectiveness of those protective systems. 14/

On April 14, 1983, the FRA and the Materials Transportations Bureau (MTB) of the DOT's Research and Special Programs Administration (RSPA) issued a Notice of Proposed Rulemaking (NPRM), 15/ which, as summarized by the MTB:

> would require that specifically identified hazardous materials being transported in existing large capacity specification 105 and 111 tank cars have the same added tank head and thermal safety systems that now are required on newly built specification 105 tank cars (HM-174) and on all specifications 112 and 114 tank cars (HM-144) when carrying those same commodities.

"Large capacity" is defined in the NPRM as exceeding 18,500 gallons; the specifically identified hazardous materials are flammable gases, anhydrous ammonia, and some shipments of ethylene oxide. In comments to the NPRM, the Safety Board stated:

> The Safety Board supports adoption of this proposal even though it limits the protective requirements to tank cars with capacity of more than 18,500 gallons that transport flammable gases, ethylene oxide, and anhydrous ammonia only. We believe that the proposed rule should be broader in scope and should require adequate protection for tank cars carrying other hazardous materials besides flammable gases, ethylene oxide, and anhydrous ammonia.

13/ Safety Effectiveness Evaluation--"Analysis of Proceedings of the National Transportation Safety Board into Derailments and Hazardous Materials, April 4-6, 1978" (NTSB/SEE-78/2).

14/ Railroad Accident Reports--"Louisville & Nashville RR. Co. Freight Train Derailment with Hazardous Materials Tank Cars, Crestview Florida, April 8, 1979" (NTSB/RAR-79/11); "Louisville and Nashville RR. Co. Freight Train Derailment, Molino, Florida, November 11, 1979" (NTSB/ATL-80-FR/008); "Illinois Central Gulf RR. Co. Freight Train Derailment and Hazardous Materials Release and Evacuation, Muldraugh, Kentucky, July 26, 1980" (NTSB/RAR-81/1); Special Investigation Report--"The Accident Performance of Tank Car Safeguards" (NTSB/HZM-80/1).

15/ RSPA, 49 CFR Parts 173 and 179, Docket No. HM-175; Notice No. 83-11, Specifications for Railroad Tank Cars Used to Transport Hazardous Materials.

BEST COPY AVAILABLE

Also in comments to the MTB, the Safety Board urged the MTB "to seek information about the extent of endangerment resulting from releases of hazardous materials, including the radius of the area in which accidental releases pose risks to persons and property, the elapsed time involved, and the ultimate harmful effects to exposed persons and property." Since the MTB had decided not to evaluate the need for added protective systems for tank cars based on acceptable risk hazard classification per given hazardous commodities, the Safety Board also stated in comments to the NPRM that as an initial effort to enhance the safety of transporting hazardous materials, those materials with a required evacuation radius of one-half mile or more should be transported in head-shielded tank cars.

Upon announcement of the final rules resulting from the NPRM on April 30, 1983, the DOT stated, "While we are completing the rulemaking process for flammable gas tank cars, the Department plans to continue to review its safety rules governing rail tank cars used for other hazardous cargoes. . . .These cargoes move in smaller amounts and less frequently than flammable gases, but they nevertheless represent a real and substantial risk in accident situations." However, the Safety Board is not aware of any such ongoing review having been initiated within the DOT to provide needed additional safeguards for tank cars carrying hazardous materials other than flammable gases, ethylene oxide, or anhydrous ammonia, or to provide needed additional protection for tank cars carrying less than 18,500 gallons of hazardous materials. From the standpoint of safety, there is no demonstrated practical difference whether a breached tank car is releasing slightly less or slightly more than 18,500 gallons of high-risk hazardous material. The Safety Board strongly believes that these unacceptable risks which are now levied on the general public and emergency responders, as well as railroad employees, due to inadequately safeguarded tank cars laden with high-risk hazardous materials must be alleviated before further catastrophic accidents occur.

The Robbins, South Carolina Accident

The operating crews of trains No. F-481 of February 23, No. F-757, Extra 5523 West, and No. F-481 of February 25 were qualified for their respective positions in accordance with SBD requirements. All of the involved dispatchers also were qualified for their positions in accordance with SBD requirements. There were no mechanical defects found in any of the trains' equipment that would have contributed to the accident. Further, there were no defects noted in the track structure that would have contributed to the accident.

The collision at Robbins was the culmination of a series of errors by the involved dispatchers and the crew of train Extra 5523 West, which were initiated by the derailment at Jackson of train No. F-690. The blockage of the single main track at Jackson necessitated the temporary holding of westbound trains to Augusta at various locations along the main line. The cars from train No. F-481 of February 23 were left in the Barnwell manual block under an absolute block occupancy authority. An absolute block, according to SBD operating rules, specifically prohibits another train from entering that block; however, train No. F-757 was authorized to enter that block with verbal permission, although the SBD operating rules cite no such provision. Further, after the crew of train No. F-757 released the verbal permission and prepared to be taxied from Robbins after leaving their train in the Barnwell manual block, the dispatcher highlighted the entry on the manual block sheet, indicating that train No. F-757 was no longer occupying that block. Subsequently a permissive block occupancy authority was established for train Extra 5523 West to enter the Barnwell manual block to pick up the cars from train No. F-481 and all of train No. F-757. The SBD operating rules cite no provision for this procedure either.

BEST COPY AVAILABLE

The work message issued to the crew of train Extra 5523 West contained instructions to pick up 32 loaded and 68 empty cars, for a total of 100 cars in the Barnwell manual block, including 2 piggyback cars, and 97 cars at Ellenton. The work message made no reference to the fact that the cars in the Barnwell manual block were from two separate trains, or that they were not coupled together. Since the presence of train No. F-757 had not been carried forward on the manual block sheets, the dispatcher made no reference to that fact when instructing the crew of train Extra 5523 West. Also, the dispatcher advised the conductor of train Extra 5523 West when at Robbins to clear the main track between Savannah and Augusta expeditiously, because he wanted to pass another train westbound to Augusta. The conductor replied that he would clear up in the Barnwell manual block after picking up the locomotive unit and three cars in the Robbins house track. That action would have necessitated a crewmember being sent to the rear of train No. F-757 to provide protection as the train was being backed up, because the cars from train No. F-757 were just inside the Barnwell manual block limit, and the locomotive and three cars were not in the clear. However, no crewmember was sent to the rear of the train. Had a crewmember been sent to the rear of the train to provide protection for a reverse movement, the cars from train No. F-481, about seven or eight car lengths tc the east of the rear of train No. F-757, would have become evident. Thus, the accident at Robbins could have been prevented. Further, had a crewmember been sent to the rear of train No. F-757, a proper inspection of the train equipment and airbrake system could have been accomplished at that time. During the 1 hour 13 minutes on the Robbins sidetrack, the crew failed to perform a proper inspection of the train equipment and airbrake system.

When train Extra 5523 West advanced onto the siding at Robbins after picking up the cars from train No. F-757, the conductor advised the dispatcher to release the block authorities that had been granted. At that time however, he apparently was not aware that the total of 100 cars, including 2 piggyback cars, had not been picked up. The conductor contacted the dispatcher 6 minutes after he released the block authority and advised that he had only 40 or 50 cars. The dispatcher compounded the errors which had been made up to that point when he read only partially from the chief dispatcher's message regarding the holding of trains No. F-481 and No. F-757, reading only that portion concerned with the former train. The dispatcher apparently rationalized the car count discrepancy by referring to additional cars to be picked up at Ellenton. However, 1 hour 13 minutes elapsed between that conversation and the train's departure westbound from Robbins. During that time period, the conductor failed to make a list of the cars in his train, despite the discrepancy in the car count. Had he done so, he would have discovered that the train contained 42 cars and a caboose, rather than the 58 cars referred to by the dispatcher. Further, although the conductor knew that he did not have the two piggyback cars referred to in the work message, he failed to reconcile the discrepancy. That discovery should have led to a realization on the part of the dispatcher and/or conductor that all of the intended cars had not been picked up.

After the dispatcher indicated the Barnwell manual block as clear and subsequently granted absolute block occupancy authority to train No. F-481 of February 25, the crew of that train had no opportunity to prevent or mitigate the impending collision. With a nominal human response time of about 3 seconds, a train moving at a reported 40 mph will travel about 176 feet before the brake is applied. The stopping distance tests performed by the SBD corroborate that although train No. F-481 may have been traveling somewhat above 40 mph, the speed of the train was certainly less than the maximum authorized 49-mph speed.

BEST COPY AVAILABLE

Mechanical Maintenance and Inspection Procedures

The cushion unit replacement performed at Charlotte on December 4, 1984, was generally in accordance with accepted practice on the SBD, as well as industry practice. However, the use of common bolts in lieu of the specified high-strength bolts, while probably not significantly contributory to the accident at Jackson, does indicate a degree of laxity in mechanical maintenance and supervisory practices. That indication of laxity is corroborated by the lackadaisical manner in which the locomotive of train No. F-690 was inspected after the derailment, despite the statements of the engineer and head brakeman that they had struck something on the track immediately before the derailment. The circumstances surrounding the derailment at Montezuma on May 15, 1985, also have added to the Safety Board's concern regarding the return to service on the SBD of unsafe freight equipment and led to the issuance, during the investigation of this accident, of Safety Recommendation R-85-76, on July 22, 1985, to the SBD, which states:

> Review and revise, as necessary mechanical maintenance, inspection, and supervisory practices of locomotive and car equipment to prevent the return to service of unsafe equipment.

The Safety Board is currently reviewing the response to this recommendation.

The Safety Board also notes that the crewmembers of train Extra 5523 West failed to perform an adequate inspection of their train after it was assembled, during the time spent at Robbins. The Safety Board believes that it is incumbent upon the SBD to address this deficiency on the part of personnel who may be called on to assemble trains at other than normally designated initial terminals. Moreover, the Safety Board notes that the FRA has not filed any report of violation against SBD in this regard, but has filed a report of violation against SBD in regard to the lack of an adequate inspection of the SBD train that derailed at Montezuma on May 15, 1985. The Safety Board is concerned that violations of Federal regulations which provide for minimal levels of safety are occurring and are being inconsistently addressed by the FRA. The Safety Board believes that the FRA must act so as not to give any credence to a perception that the railroad industry, or that any given carrier within the industry, may conduct its operations in disregard of safety regulations, or may anticipate inconsistent enforcement of safety regulations. Further, the Safety Board believes that a vigorous and consistent enforcement of safety regulations will benefit the railroad industry, as well as railroad employees and the general public.

Manual Block System Dispatching

The manual block system of train dispatching is regarded as an operationally efficient method, and the Safety Board does not question its appropriateness. However, disregard of established and documented procedures will invariably invalidate the safeguards established in these procedures. The actions of the dispatchers involved in the movem nts of trains at or near Robbins indicate a disregard for the established and documented procedures of the SBD, which resulted in lack of specificity, and incomplete understanding in communications between the dispatchers and the train crewmembers. The cars from train No. F-481 of February 23 were left in the Barnwell manual block under an absolute block authority, which specifically precludes entry into that block by another train; however, train No. F-757 was directed into that block with verbal permission, a procedure for which there is no provision in SBD rules, and train Extra 5523 West was directed into that absolute block with a permissive block authority, again a procedure also for which there is no provision in the SBD rules. It was necessary that the

BEST COPY AVAILABLE

block occupancy status for the cars of train No. F-481 of February 23 be revised from absolute block to permissive block, before train No. F-757 or Extra 5523 West could have been directed into the Barnwell manual block by the dispatcher to comply with SBD's established and documented procedures. Moreover, if the entry onto the manual block sheet for train No. F-757 had not been highlighted, which indicated that train No. F-757 was no longer occupying the Barnwell manual block, the dispatcher directing the movement of train Extra 5523 West probably would not have transmitted erroneous information to the conductor of that train.

A total of 36 hours 10 minutes elapsed from the time train No. F-757 was left in the Barnwell manual block without being referenced on the manual block sheet until the collision at Robbins. The Safety Board believes that this was certainly a sufficient time span in which SBD management, especially the Florence division chief dispatcher, should have become aware of the situation and taken measures to ensure the safe operation of trains affected by the derailment at Jackson. The Safety Board believes such action was especially necessitated in view of the chief dispatcher's supervisory evaluation of the three dispatchers who were working during the period of extraordinary dispatching events after the derailment at Jackson. The chief dispatcher's failure to make any special efforts to supervise individuals he considered to be marginal in terms of job performance was not a responsible exercise of his responsibility to ensure compliance with the established and documented procedures of the SBD. The Safety Board's concern regarding dispatching practices and supervisory procedures on the SBD led to the issuance, during the investigation of this accident, of Safety Recommendations R-85-77 and R-85-78 on July 22, 1985, to the SBD, which state:

> R-85-77
>
> Review and revise, as necessary, dispatching practices and prescribed procedures for dispatching trains in manual block territories to provide for the safe operation of trains.
>
> R-85-78
>
> Review and revise, as necessary, supervisory procedures in dispatching offices having manual block territories to provide for the safe dispatching of trains.

The Safety Board is currently reviewing the response to these recommendations.

Although radio communication capability was not a factor in either accident, crewmember statements that permanent radios on cabooses malfunction more often than not, and the master mechanic's acknowledgement that reports of malfunctioning radios occur at a rate of 25 percent, leads the Safety Board to believe that the SBD should investigate whether unreliable radio communication capability is affecting the safe operation of trains. Although SBD rules regarding manual block system dispatching also permits the use of telephone, the Safety Board is concerned that inadequate radio communications (whether due to equipment failures or system design) will compromise a dispatching system based on verbal communications between dispatchers and train crewmembers to the detriment of safety.

BEST COPY AVAILABLE

CONCLUSIONS

Findings

1. The Seaboard System Railroad operates through Jackson, South Carolina, and Robbins, South Carolina, by timetable, by special instructions, and by verbal instructions of control station operators or dispatchers utilizing radio or wayside telephones to communicate with the conductors and/or engineers of trains.

2. Train F-690, which derailed at Jackson, South Carolina, struck a cushion unit that was lying on the track.

3. Postaccident inspection of cushion-underframe boxcar SBD 156678, which had been in a train that passed through Jackson, South Carolina, about 5 hours before the accident, revealed that the car was missing its cushion unit. The cushion unit found at the accident site was determined to have come from boxcar SBD 156678.

4. The cushion unit which dropped from boxcar SBD 156678 was a replacement unit installed into that car at Charlotte, North Carolina, on December 4, 1984.

5. Because of permissible dimensional tolerances of the installation, the end cap of the replacement cushion unit probably wedged between the fixed draft stop and the end of the carrier plate.

6. The wedging of the cushion unit end cap between the fixed draft stop and the end of the carrier plate resulted in direct transmittal of dynamic forces which sheared the carrier plate retaining bolts and led to the loss of the cushion unit.

7. The use of common bolts in lieu of the specified high-strength bolts in the cushion unit replacement on boxcar SBD 156678, the lackadaisical manner in which the locomotive of train No. F-690 was inspected after the derailment in Jackson, South Carolina, on February 23, 1985, and the inadequate inspection and return to service of covered hopper car SAL 324590 which derailed in Montezuma, Georgia, on May 15, 1985, indicate laxity in Seaboard System Railroad mechanical maintenance and supervisory practices.

8. Although the derailed tank cars at Jackson, South Carolina, were equipped with type-"F" top-and-bottom shelf couplers, they alone did not provide sufficient protection to the cars in this high-speed derailment.

9. Had the derailed tank cars at Jackson, South Carolina, been equipped with head shields, the tank head penetrations and subsequent releases of hazardous materials from those penetrations in five of the eight tank cars probably would not have occurred.

10. The Seaboard System Railroad promptly provided the emergency response personnel with the data necessary for them to assess and contain the emergency as well as possible.

11. The response to the accident at Jackson, South Carolina, by local emergency response personnel was prompt, efficient, and well organized.

BEST COPY AVAILABLE

12. There were no mechanical defects found in train No. F-690 that would have contributed to the accident at Jackson, South Carolina.

13. There were no defects in the track structure that would have contributed to the accident at Jackson, South Carolina.

14. The blockage of the single main track at Jackson, South Carolina, necessitated the temporary holding of westbound trains to Augusta, Georgia, at locations along the main line.

15. The cars from train No. F-481 were left in the Barnwell manual block on February 23, 1985, under an absolute block occupancy authority, which prohibits any other train from entering that block.

16. The crew of train No. F-757 was directed by the dispatcher with verbal permission to place their train into the Barnwell manual block on February 23, 1985, where the cars from train No. F-481 were being temporarily held under an absolute block authority.

17. The crew of train Extra 5523 West was granted a permissive block occupancy authority to enter the Barnwell manual block on February 25, 1985, where the cars from train No. F-481 were being temporarily held under an absolute block authority, and train No. F-757 had been placed with verbal permission.

18. The conductor of train Extra 5523 West released the block occupancy authority that had been granted for his train without establishing that all of the freight cars to be picked up in the Barnwell manual block had, in fact, been picked up.

19. The crew of train Extra 5523 West failed to perform a proper inspection of the train equipment and airbrake system after picking up the cars from train No. F-757.

20. The chief dispatcher's supervisory evaluation of the three dispatchers who were working during the period of extraordinary operations after the accident at Jackson, South Carolina, was marginal in terms of job performance; however, the chief dispatcher failed to make any special effort to supervise those dispatchers.

21. Apparent inconsistencies of radio communication capability in a dispatching system based on verbal communications among dispatchers and train crewmembers may be detrimental to safety.

Probable Causes

The National Transportation Safety Board determines that the probable cause of the accident at Jackson, South Carolina, on February 23, 1985, was the laxity of the Seaboard System Railroad mechanical maintenance, inspection, and supervisory practices which resulted in the striking by train No. F-690 of a cushion unit that had dropped onto the track structure from a cushion-underframe boxcar about 5 hours earlier. Contributing to the severity of the accident was the lack of head shield protection on tank cars carrying high-risk hazardous materials.

BEST COPY AVAILABLE

The National Transportation Safety Board determines that the probable cause of the accident at Robbins, South Carolina, on February 25, 1985, was the failure of the dispatchers on duty during a period of unusual dispatching events, necessitated by the accident at Jackson, South Carolina, 2 days before, to adhere to established and documented procedures. Contributing to the accident was the failure of the Seaboard System Railroad to supervise the dispatchers properly to ensure adherence to its established and documented procedures.

RECOMMENDATIONS

As a result of these investigations, the National Transportation Safety Board made the following recommendations:

--to the Seaboard System Railroad:

Establish a procedure in territories where trains are dispatched by manual block rules to ascertain that equipment temporarily stored on main tracks is removed before resuming dispatching of trains over those tracks. (Class II, Priority Action) (R-85-102)

Review and upgrade, as necessary, train radio communications capability to better ensure the safe dispatching of trains, particularly in territories where trains are dispatched by manual block rules. (Class II, Priority Action) (R-85-103)

Provide formalized and definitive training to train crewmembers regarding inspection practices for assembling trains at designated initial terminals as well as at other than normally designated initial terminals, to ensure that proper inspections of train equipment and airbrake systems are made. (Class II, Priority Action) (R-85-104)

--to the Research and Special Programs Administration:

Require that all tank car shipments of hazardous materials with an isolation radius of one-half mile or more, as recommended by the U.S. Department of Transportation Emergency Response Guidebook, be transported in tank cars equipped with head shield or full tank head protection. (Class II, Priority Action) (R-85-105)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
Vice Chairman

/s/ G.H. PATRICK BURSLEY
Member

October 16, 1985

BEST COPY AVAILABLE

BLANK PAGE

APPENDIXES

APPENDIX A

INVESTIGATION

The National Transportation Safety Board was notified of the accident at Jackson, South Carolina, on February 23, 1985, about 8:25 a.m. The Safety Board immediately dispatched investigators from its Washington, D.C., headquarters to the accident site.

Groups were formed to investigate the hazardous material, human performance, mechanical, operational, and track structure aspects of the accident. The groups were composed of personnel from the Seaboard System Railroad, the Federal Railroad Administration, the South Carolina Public Service Commission, and emergency response personnel, and were directed by Safety Board investigators.

On February 25, 1985, during the investigation of the derailment at Jackson, South Carolina, Safety Board investigators were alerted to the collision which had just occurred at Robbins, South Carolina, about 14 miles distant. Investigations of both accidents were then concurrently conducted. Pullman Standard, Inc., and Joy Manufacturing Company representatives were subsequently added to the mechanical group to provide additional technical expertise to postaccident tests.

A deposition proceeding was held in Charleston, South Carolina, on March 27-28, 1985. Sworn testimony of the facts of both accidents was taken from 14 witnesses. Parties to the proceeding were the Seaboard System Railroad, the Federal Railroad Administration, the American Train Dispatchers Association, the Brotherhood of Locomotive Engineers, and the United Transportation Union.

BEST COPY AVAILABLE

APPENDIX B

PERSONNEL INFORMATION

Enginer, train F-690

R. G. Burgstiner, age 33, was employed by the Seaboard Coast Line Railroad (SCL), a predecessor company of the Seaboard System Railroad (SBD), on December 30, 1970, as a switchman. On April 13, 1972, he was transferred to locomotive fireman, and on March 29, 1974, he was promoted to locomotive engineer. He was current on SBD operating rules.

Conductor, train F-690

J. B. Igou, age 46, was employed by the SCL on December 17, 1966, as a switchman. On January 30, 1969, he was promoted to conductor. He was current on SBD operating rules.

Brakeman, train F-690

C. J. Williams, age 44, was employed by the SCL on May 13, 1966, as a switchman. On March 12, 1968, he was promoted to conductor. He was current on SBD operating rules.

Flagman, train F-690

W. J. Holder, age 39, was employed by the SCL on June 13, 1969, as a switchman. He was current on SBD operating rules.

Engineer, train F-481, February 23, 1985

F. J. Johnston, age 58, was employed by the Atlantic Coast Line Railroad (ACL), a predecessor company of the SBD on March 28, 1948, as a locomotive fireman. On August 17, 1953, he was promoted to locomotive engineer. He was current on SBD operating rules.

Conductor, train F-481, February 23, 1985

R. E. Pierce, Jr., age 39, was employed by the SCL on July 16, 1963, as a trainman. On September 23, 1963, he was transferred to locomotive fireman, and on April 4, 1964, he relinquished locomotive fireman rights and returned to trainman. In April 1967, he was promoted to conductor. He was current on SBD operating rules.

Brakeman, train F-481, February 23, 1985

T. Watts, age 39, was employed by the SCL on March 1, 1966, as a switchman. He was promoted to yard foreman on August 31, 1968, and to conductor on July 31, 1976. He was current on SBD operating rules.

Flagman, train F-481, February 23, 1985

L. A. Gordon, age 40, was employed by the SCL on August 19, 1963, as a switchman, and he was promoted to conductor. He was current on SBD operating rules.

BEST COPY AVAILABLE

Engineer, train F-757

E. F. Wilhite, age 41, was employed by the ACL on December 11, 1967, as a trainman. On June 16, 1968, he was transferred from trainman to locomotive fireman. On November 12, 1971, he was promoted to locomotive engineer. He was current on SBD operating rules.

Conductor, train F-757

P. H. Hoover, age 58, was employed by the ACL on March 18, 1948, as a trainman. On January 20, 1956, he was promoted to conductor. He was current on SBD operating rules.

Brakeman, train F-757

A. H. Baker, age 37, was employed by the SCL on May 24, 1968, as a switchman. On March 23, 1970, he was promoted to yard foreman. On March 31, 1982, he was promoted to conductor. He was current on SBD operating rules.

Flagman, train F-757

E. Price, age 44, was employed by the ACL on March 27, 1968, as a switchman. On March 23, 1970, he was promoted to yard foreman. He was current on SBD operating rules.

Engineer, train Extra 5523 West

W. L. Cox, Jr., age 36, was employed by the SCL on July 28, 1972, as a locomotive fireman. On March 25, 1974, he was promoted to locomotive engineer. He was current on SBD operating rules.

Conductor, train Extra 5523 West

J. Dandy, age 37, was employed by the SCL on May 1, 1978, as a switchman. On April 7, 1981, he was promoted to yard foreman. On September 12, 1983, he was promoted to conductor. He was current on SBD operating rules.

Brakeman, train Extra 5523 West

P. E. Jones, age 32, was employed by the SCL on March 27, 1980, as a switchman. On October 15, 1984, he was promoted to conductor. He was current on SBD operating rules.

Flagman, train Extra 5523 West

J. I. Knox was employed by the SCL on April 27, 1965, as a switchman. On August 8, 1968, he was promoted to yard foreman. He was current on SBD operating rules.

BEST COPY AVAILABLE

Engineer, train F-481, February 25, 1985

W. D. Silver, age 37, was employed by the SCL on July 11, 1969, as a laborer. On April 18, 1977, he was transferred to electrician apprentice, and on October 5, 1977, he was approved for service as a hostler. On February 22, 1980, he was promoted to locomotive engineer. He was current on SBD operating rules.

Conductor, train F-481, February 25, 1985

T. Nowlin, age 37, was employed by the SCL on January 18, 1967, as a mail porter. On April 17, 1968, he transferred to trainman, and he was promoted to conductor. He was current on SBD operating rules.

Brakeman, train F-481, February 25, 1985

Same employee that was flagman on train No. F-481 on February 23, 1985.

Flagman, train F-481, February 25, 1985

Same employee that was brakeman on train No. F-481 on February 23, 1985.

Chief Dispatcher

B. A. Barnes was employed by the ACL on October 4, 1954, as a station helper. He held the positions of telegraph operator, station agent, train order operator, train dispatcher, and was promoted to chief dispatcher on June 15, 1983. He was current on SBD operating rules.

Dispatcher, 4 p.m. to midnight, February 23, 1985

D. J. Montgomery, age 54, was employed by the Western Railway of Alabama, a predecessor company of the SBD on May 31, 1965, as a clerk. On January 26, 1974, he was promoted to dispatcher. He was current on SBD operating rules.

Dispatcher, 4 p.m. to midnight, February 24, 1985

A. D. Bigelow, age 47, was employed by the SCL on July 22, 1955, as a messenger. On February 15, 1956, he became a clerk/telegrapher. On August 6, 1970, he was promoted to dispatcher. He was current on SBD operating rules.

Dispatcher, midnight to 8 a.m., February 24, 1985, midnight to 8 a.m., February 25, 1985

W. K. Terry, age 40, was employed by the SCL on June 8, 1965, as a telegrapher. On November 22, 1967, he was assigned as a clerk/train order operator. On April 17, 1979, he was promoted to train dispatcher. He was current on SBD operating rules.

BEST COPY AVAILABLE

APPENDIX C

WORK MESSAGE RECEIVED BY CREW OF EXTRA 5523 WEST

C + E Extra 5523 West (X) 2/24/85

Pick unit 5523 + 5535 from United Fabric Track at Jackson - Run engine light to Robbins. Pick up Eng 4608 + 3 cars from House Track ladder. Pick from Augusta Sub Mainline in Barnwell Block Robbins 32 lds 68 Empties 2 Pigs. Pick up from Elkerton 97 cars all enroute Augusta

B A Barnes

BEST COPY AVAILABLE

APPENDIX D

RAILROAD ACCIDENT REPORTS CONCERNING TANK CARS CARRYING HIGH-RISK HAZARDOUS COMMODITIES

"Pennsylvania Railroad Train PR-11A, Extra 2210 West and Train SW-6, Extra 2217 East, Derailment and Collision, Dunreith, Indiana, January 1, 1968" (NTSB/RAR-68/03).

"Southern Railway Company Train 154, Derailment with Fire and Explosion, Laurel, Mississippi, January 25, 1969" (NTSB/RAR-69/01).

"Illinois Central Railroad Company Train Second 76 Derailment at Glendora, Mississippi, September 11, 1969" (NTSB/RAR-70/02).

"Derailment of Toledo, Peoria and Western R.R. Co. Train No. 20 with Resultant Fire and Tank Car Ruptures, Crescent City, Illinois, June 21, 1970" (NTSB/RAR-72/2).

"Hazardous Materials Railroad Accident in the Alton and Southern Gateway Yard in East St. Louis, Illinois, January 22, 1972" (NTSB/RAR-73/1).

"Hazardous Materials Accident in the Railroad Yard of the Norfolk and Western Ry. at Decatur, Illinois, July 19, 1974" (NTSB/RAR-75/4).

"Hazardous Materials Accident at the Southern Pacific Transp. Co. Englewood Yard at Houston, Texas, September 21, 1974" (NTSB/RAR-75/7).

"Derailment of Tank Cars with Subsequent Fire and Explosion on Chicago, Rock Island and Pacific R.R. Co., Des Moines, Iowa, September 1, 1975" (NTSB/RAR-76/8).

"Chicago and Northwestern Transp. Co. Freight Train Derailment and Collision, Glen Ellyn, Illinois, May 16, 1976" (NTSB/RAR-77/2).

"Derailment of a Burlington Northern Freight Train at Belt, Montana, November 26, 1976" (NTSB/RAR-77/7).

"Louisville and Nashville R.R. Co. Freight Train Derailment and Puncture of Anhydrous Ammonia Tank Cars at Pensacola, Florida, November 9, 1977" (NTSB/RAR-78/4).

"Collision of a Louisiana & Arkansas Ry. Freight Train with a Tractor-Semitrailer at Goldonna, Louisiana, December 28, 1977" (NTSB/RHR-78/1).

"St. Louis Southwestern Ry. Co. Freight Train Derailment and Rupture of Vinyl Chloride Tank Car, Lewisville, Arkansas, March 29, 1978" (NTSB/RAR-78/8).

"Derailment of Seaboard Coast Line R.R. Train No. 120 at Colonial Heights, Virginia, May 31, 1982" (NTSB/RAR-83/04).

"Derailment of Illinois Central Gulf RR. Freight Train Extra 9629 East (GS-2-28) and Release of Hazardous Materials at Livingston, Louisiana, September 28, 1982" (NTSB/RAR-83/05).

"Denver and Rio Grande Western RR. Co. Train Yard Accident Involving Punctured Tank Car, Nitric Acid and Vapor Cloud and Evacuation, Denver, Colorado, April 3, 1983" (NTSB/RAR-85/10).

* U.S. GOVERNMENT PRINTING OFFICE: 1985-491-093:20057

BEST COPY AVAILABLE